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Rotary Wing Proficiency-Based Aviator Selection System (PASS)

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LEVEL II

by

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The Proficiency-Based Aviator Selection System (PASS) is the result of an operational feasibility program developed to determine whether a learning sample approach could be used to select candidates for rotary wing aviator training. PASS was based on the Automated Pilot Aptitude Measurement System (APAMS), a five-hour learning sample of fixed wing piloting tasks, developed for the Air Force Pilot Selection Program. PASS utilizes a UH-1 Flight Simulator (UH-1FS) with a five-degree-of-freedom motion base to present the syllabus and test materials. The APAMS syllabus was extensively modified to

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conform to rotary wing flight operations, and the UH-1FS software was reconfigured and formatted to meet the PASS requirements for training and performance measurement. Four voice synthesizers (VOTRAX) were interfaced to the UH-1FS to provide vocal feedback. The operational capability of the PASS was demonstrated in a test with 11 experienced rotary wing pilots and 11 candidates for rotary wing training.

The primary audience for this report will be operational personnel in training selection and simulation, particularly for rotary wing aircraft.

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HISTORICAL DEVELOPMENT OF THE PASS OPERATIONAL SYSTEM

HISTORICAL DEVELOPMENT OF THE PASS OPERATIONAL SYSTEM

This section is intended to provide a historical overview of the rationale for development of the PASS operational system, followed by a descriptive summary of the major events of the program development. Decision points are emphasized, within a program management orientation. Subsequent sections are primarily concerned with the technical aspects of the PASS program implementation.

BACKGROUND

As of 1976, Army aviator candidates in the Rotary Wing Aviator Training (RWAT) Program were experiencing an unacceptable level of attrition. The Army hypothesized that an improved selection methodology for aviator candidates might meet the primary objective: to improve the quality among aviator candidates prior to a significant investment in training. A concomitant reduction of training costs due to flight deficiencies, self-elimination and setbacks, and enhancement of safety in the program by assessment of workload were critical to attainment of this program objective.

To satisfy the requirement for a system that would provide an enhanced capability for the U.S. Army (RWAT) Program, a contract was awarded to McDonnell Douglas Astronautics Company - St. Louis (MDAC-St. Louis). The contractor had previously completed a pilot selection study for the Air Force in 1975, directed at the development and evaluation of an Automated Pilot Aptitude Measurement System (APAMS), which employed a "learning sample" technique for use in candidate selection for the Air Force Undergraduate Pilot Training (UPT) program. The results from this study indicated that use of the learning sample technique offered a significant potential for substantial reduction of attrition rates during UPT.

While recognizing that significant differences were inherent in the Rotary Wing Aviator Candidate Selection Program, the Army decided that the contractor's APAMS experience, coupled with certain inherent similarities between the two programs, could enhance the probability of obtaining the required predictive potential for effective completion of the Army program called the Proficiency-Based Aviator Selection System (PASS).

The instructions, flight maneuvers and syllabus tasks to be included in the learning sample would require significant revision, as the developmental program would utilize the UH-1 Flight Simulators (FS) at Ft. Rucker, Alabama. Software requirements for the new delivery system would differ; new hardware components would be utilized. In spite of these acknowledged differences, the basic objectives of the program, the rationale for learning sample selection, performance measurement methodology, and the general criteria to be used for the predictive capability assessment shared many APAMS techniques. It was hoped that the transfer of APAMS experience could be exploited in the PASS development efforts.

In brief, the specific objectives of the PASS Program were:

- To develop the concept of syllabus-based testing for rotary wing operations employing a "learning sample" approach providing improved quality selection among Army aviator candidates

- To provide the necessary software programs to implement the syllabus in the UH-1FS and obtain the required performance measures (without significant modification to the UH-1FS or interference with its utilization in meeting current training requirements)
- To integrate the syllabus, software and additional new hardware components into the UH-1FS
- To demonstrate the system's capability to operate as proposed through the collection of data from an initial group of candidates and training of ARI personnel in PASS system operation and maintenance procedures
- To support ARI in data analysis to determine the system's predictive potential and the preparation of the final report.

The original contract specified completion of System Definition (Phase I) and System Design (Phase II), ending with a single cockpit demonstration. The follow-on funding for System Integration (Phase III) was envisioned. During contract negotiations, this philosophy was changed to include a Phase III effort and funding in the basic contract to provide for an operational capability demonstration and acceptance test for the four cockpit system. Schedule realignment of Phases II and III were mutually agreed upon at the initial planning and coordination meeting at Ft. Rucker on 16-18 February 1977. Additional items of discussion at that time included contractor device access times, work hours, candidate testing availability, a monthly status report, and contractor coordination requirements for hardware/software modifications. Attendees included personnel from ARI, Singer-Link, USAAVNC and MDAC-St. Louis.

SYSTEMS DEFINITION SUMMARY

Central to the contractor's understanding was the UH-1FS device and associated hardware/software to be utilized for the selection program was capable of operationally supporting the proposed syllabus to implement a minimal selection program. This assumption was found to be incorrect as the development progressed. Specifically, the Honeywell DDP-516 computer possessed limited timing and available core as a major deficiency, resulting in minimal spare real computing time. Based on the software capability assessment, it was considered doubtful that simultaneous training and selection would be possible (Appendix G). At ARI's request, an in-depth examination of this problem was undertaken by MDAC with an emphasis on examination of suitable alternative systems. This study considered cost, support and scheduling constraints. Results were presented to ARI at Ft. Rucker and are found in the Phase I Report (System Definition), dated 1 June 1977. The resulting decision by ARI was retention of the DDP-516 to be utilized only in a dedicated "selection only" mode.

Implementation proceeded on this "selection only" basis. Available real time computing under the proposed system approached 100%. It was understood that it would be impossible to ascertain what loading would actually force the system into dropping "frames" until implementation was initiated. The implementation strategy adopted utilized the proposed syllabus with enhancements added one at a time until frame slippage occurred in the system. At this point, exchanges for higher

priority items would be introduced and the system balanced. NOTE: Current system operation has provided limited simultaneous selection and training in the non-automatic mode. Slightly degraded training operation is provided, i.e., all NAV functions are not available, resulting in a much better cost effectiveness of the device than was originally considered possible. An expansion of the trade-offs involved in this decision is covered in Sections 2, 3 and Appendix G.

Evaluation of all required hardware components and system integration considerations was completed in preparation for the System Design and Implementation phases; hardware definition was established in early June. Comprehensive information concerning the Honeywell DDP-516 was difficult to obtain, particularly in the software component capability areas. This was largely due to the obsolescence of the equipment; the problem of effective software definition and design was increased significantly. Syllabus definition was proceeding with the major emphasis on system integration. During this period of learning sample and syllabus definition, selected members of the contractor team operated the UH-1FS with extensive contractor/UH-1FS instructor discussions and critiques to establish the basis for further development of the learning sample. The syllabus outline was developed in conjunction with the ARI contract monitor. The learning sample content and format were coordinated continuously. Feedback requirement methodology and performance measures were defined and documented with maneuver profiles and message definition planned to provide extensive back-up materials for operational use. Programmed instructional texts for pre-cockpit use by PASS candidates were under development. The Phase I Report (Systems Definition), 1 June, summarizes the posture and progress of the PASS Program at that point.

PASS DESIGN/IMPLEMENTATION

The major considerations for the Design and Implementation Phases are viewed from an integrated software, hardware and syllabus development orientation. As of June 1977, the PASS software and hardware device access requirements had been presented by telecon to the contract monitor for utilization in preparation of a Letter of Agreement between ARI, Singer-Link, USAAVNC and MDAC-St. Louis. This Memorandum of Understanding (MOU) is included as Appendix J. The MOU served to clarify the roles and responsibilities of all parties in the PASS Design and Integration Phases and provided concrete program guidance throughout the operational development and implementation periods.

In July, MDAC hardware integration engineers performed the necessary serial to parallel VOTRAX modification in St. Louis for the initially procured GFE VOTRAX unit. A higher than anticipated contractor cost was experienced in equipment procurement for this task.

Immediately following submission of the Phase I Report on 1 June 1977, one MDAC software engineer was assigned full time to Ft. Rucker to support the Design and Implementation Phases. Device access times at Ft. Rucker were in accordance with the MOU, causing only minor delay in the software development effort. Syllabus refinement and continuing revision based on coordination with the contract monitor and instructor pilots continued. Maneuver analyses, profile preparation, script development, tape and narration revision, and pre-cockpit programmed text development were a continuing process augmented by in-cockpit reviews and critiques.

The DDP-516 Honeywell option drawer and parallel output channel (POC) VOTRAX interface was installed and checked out by MDAC engineering personnel in August 1977 at Ft. Rucker. Problems were encountered in enabiing all four (4) VOTRAX assemblies, but on 17 August all VOTRAX devices responded as designed except for the No. 2 cockpit. A decision was made to request an investigation of this problem by the POC vendor, Boudreau Associates, as they were scheduled to travel to Ft. Rucker to install the tape drive unit for the PASS system (Appendix K). The problem was determined to be a sense line on POC No. 2 and was satisfactorily repaired by Boudreau on 18 September 1977. Immediately following installation of the tape drive unit, the MDAC software engineer verified operation within the PASS system for data collection purposes. All PASS hardware items have shown successful operation (except for a minor VOTRAX problem of a circuit board on No. 4; repaired by warranty) since 15 October 1977. The status of all PASS program hardware reconfiguration activities is referenced in Appendix H.

A major problem surfaced during this period was a "random spike" phenomenon during pulsing of the Crown audio tapes. These audio tapes are an integral part of the UH-1FS system and provide audio instructions to the cockpits, vehicle motion parameters, auto-sequence segment initiation, and VOTRAX cueing in the PASS system. It was noted that stray and/or intermittent spikes were generated on the Crown tapes when the pulsing device in St. Louis was utilized, even though several test tapes from this source had previously shown satisfactory operation at Ft. Rucker. A contractor decision was made that all Crown tapes would be pulsed utilizing the Army equipment at Ft. Rucker. This provided a positive correction for the remainder of the program.

Performance measurement and data collection techniques received specific attention with frequent meetings and discussions with the contract monitor. Programmed texts were reviewed by ARI personnel, revised, finalized and printed. Software task segmentation of the syllabus sessions was developed and implemented into the system; design and coding were nearing completion. Limited four cockpit operational checks were conducted utilizing task segments from Sessions 1 - 5, with trial runs made on the assembled sessions using ARI and "naive" Army personnel. During this period of high activity, personnel from Singer-Link, World Wide Software, Inc., MDAC, U.S. Army and ARI worked closely together with excellent cooperative results, particularly during actual balancing of the system. This supportive developmental approach worked very well. It conserved valuable technical manpower by utilizing other personnel in the cockpits for checkout, allowed valuable comments from the subjects, and most improtantly, substantially promoted integration efforts for the four cockpit system operation. As trial runs were performed for each session/segment, minor software corrections to "fine tune" the system were accomplished. Gradually, the entire system was balanced with a syllabus/software optimization; data collection and performance measurement techniques that showed promise within the existing system were examined, revised and implemented.

On 15 November 1977, an ARI memo, "Modifications to PASS and PASS Development Schedule," was received. The main thrust of this memo revolved around the requirement for more testing time during the sessions as they were currently structured. Immediate action was instituted to determine a satisfactory method to provide the required increased testing sessions short of a total syllabus revision. The method agreed upon was to enlist the help of the console operators in order to select previous testing segments from existing sessions to initiate Sessions 3 and 4.

Sessions 1, 2, and 5 were extensively revised (Appendix L). All five sessions were renarrated, windows inserted and pulsed. Software reprogramming, debugging and checkout were accomplished. Major emphasis was again placed on data collection and performance measurement techniques and integration into the balanced system, with "naive" candidate assessment and validation of data collection/performance measurement techniques scheduled to occur concurrently. The Console Operators Handbook and Maneuver Guides were defined and implemented (Appendix E). The date for operational capability/system acceptance was set.

A contractor decision for a no-cost 45 day contract extension was considered necessary at this time to accommodate these system requirements. This contract extension request was based on the extensive syllabus and software revisions, "naive" candidate availability for the four cockpit system evaluation, and perturbations in data collection and performance measurement requirements (Appendix M). The "naive" candidate evaluation and the operational capability/system acceptance testing were accomplished concurrently and are documented in Section 5.

During the development and testing period, several important areas, not fully accomplished due to the priority placed on additional testing, were identified and suggested for product improvement to optimize the PASS system (see Section 6). Several of these suggested areas are currently under modification with an ARI requested six week cost extension.

This management philosophy, with the contractor and ARI working closely together throughout the critical Design and Implementation Phases of the PASS development effort, has ultimately provided an operationally functional Army aviator selection device viewed as a key element in mission track realization with a high potential for cost saving for the RWAT program and subsequent Army programs.

SECTION 2

PASS SYLLABUS DEVELOPMENT

SYLLABUS DEFINITION AND DEVELOPMENT

The following section of the report presents a detailed discussion of the PASS syllabus, includes a brief description of the learning sample selection process, describes the development of the instructional materials, defines the concepts involved in providing feedback to facilitate learning, and specifies the measures used to assess performance.

The syllabus developed for the PASS program consists of a five-hour sample of flight tasks representative of those required in learning to fly a helicopter. It includes a series of learning tasks involving the use of the controls and instruments arranged in order of increasing complexity.

LEARNING SAMPLE SELECTION

The PASS learning sample syllabus was based on a previous pilot selection program entitled the Automated Pilot Aptitude Measurement System (APAMS)[1] that was developed by MDC for the Air Force using a fixed wing configuration. PASS, like the APAMS program, was designed to measure those behavioral characteristics thought most likely to be predictive of pilot capability.

The objective of PASS was the development of an efficient selection system and not a training program, as such. Training was accomplished only insofar as necessary to measure performance on the sample of piloting tasks. Flight tasks for the PASS programs were selected and structured into a syllabus so as to reflect individual differences in: basic psychomotor abilities, learning rates, multi-task integration, workload capacity and control of attention.

The essential elements of the rationale used in the selection of the learning sample can be summarized as follows:

a. To insure predictability of pilot success, the learning sample must be designed to isolate those characteristics of behavior which empirical or experimental data and/or sound theoretical formulations indicate may be closely related to that success. These include:

   (1) measures of psychomotor capabilities;

   (2) measures of learning capacities and rates, that is, the ability to apply or modify these basic psychomotor capabilities into integrated patterns of behavior essential to flight success;

   (3) the ability to exercise these capabilities, basic or learned, under stress or under conditions of increased overload.

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[1] Long, G. E. and Varney, N. C. The Automated Pilot Aptitude Measurement System (APAMS). Lackland AFB, Air Force Human Resources Laboratory, September 1975.

b. The maneuvers or tasks selected for the learning sample to assess the behavioral capabilities noted in a. must also be realistic representatives of the more discriminating tasks or maneuvers included in the RWAT syllabus.

c. The learning sample must, however, be restricted to those tasks or maneuvers, or elements of maneuvers, that can be learned to some minimum level of measurable proficiency within the limited time available for training and testing (5 hours), but at the same time not be drastically affected by small amounts of practice; that is, a task was not included if it could be mastered in one practice trial.

d. The task must be such that instructions and training for its accomplishment can be standardized and provided by an automated instructional system that can be developed and produced within the cost and schedule constraints of the contract and the performance limitations of the UH-1FS.

e. The learning sample must include only those tasks or maneuvers in which variations between student performance and variation between trials for a given student can be measured quantitatively and reliably by the test equipment, (including the UH-1FS).

For example, an instrument take-off and climb-out was included in the proposed syllabus outline; however, it could not meet the constraints imposed by item c. of the learning sample rationale. It was learned that Instructor pilots experienced difficulty in successfully completing instrument takeoff and climb-out in the UH-1FS; thus, a flight naive subject could not be expected to attempt this maneuver within the time indicated. As a substitute task for the takeoff and climb-out maneuver, the deceleration/acceleration maneuver was selected because it is also a difficult coordination task, and it does meet all the essential elements of the learning sample rationale. Additionally, it fits well into the building block approach to the syllabus maneuver order of presentation.

Two additional tasks, a rectangular course and a traffic pattern as defined in the proposal, did not meet the conditions stated in paragraphs c. and d. of the learning sample rationale. A rectangular course and a traffic pattern using only the UH-1FS forward instrument panel would have been very difficult tasks to learn within the limited time available for training. VOR tracking using a single station was substituted for these maneuvers.

Additionally, maneuvers that would be obvious candidates for discriminating between successful and unsuccessful RWAT training candidates could not be included in the learning sample because the UH-1FS was not configured to simulate them. Thus, hovers and autorotations were eliminated from consideration.

However, analysis of the specific requirements imposed by the above learning sample rationale in relation to the variety of potential tasks and maneuvers available to choose from indicated there were a number of possibilities for the content of a learning sample that would meet the learning sample rationale requirements. Therefore, it was apparent that it would not be efficient to spend a great amount of effort in selecting the "optimum" maneuvers or tasks, or in the justification of that selection, as long as the choice met those requirements.

The learning sample that was selected was drawn from elements of the Army Rotary Wing Aviator Training (RWAT) syllabus. Maneuvers were selected which required the subject to control individually, and in various combinations of increasing complexity, all of the six basic flight parameters - altitude, airspeed, heading, vertical speed, turn rate and attitude. The sequencing of learning tasks was designed to progress from single variable tracking tasks using a single control (e.g., controlling attitude with the cyclic), through multivariable tracking, to multivariable tracking tasks with several controls (e.g., pitch, heading, altitude, airspeed, rate of climb, with cyclic, collective and pedals).

Maneuvers were selected and sequenced so that insofar as possible each learning and testing session was an extension of, and utilized the skills learned, from the previous learning and testing sessions. In this manner, information on both the degree of basic motor capabilities possessed by the subject and learning rates could be obtained. This procedure also required the subject to integrate previously learned skills and behavior patterns of prior tasks into each new task in a building block manner.

In order to simulate more closely the real world pilot workload, a communications side task was added to the syllabus structure. The communications task consists of responding to a communications call check by tuning the UHF radio to a designated channel, keying the microphone switch and repeating his/her call sign. If the candidate pilot fails to respond within a ten second time interval or responded incorrectly, the communications call is repeated. Communications call checks are interspersed throughout steady state maneuver testing only. (Steady states are defined as those segments of a maneuver that require maintenance of a fixed attitude.) This side task requires the PASS RWAT candidate to learn how to divide his/her attention appropriately.

A summary of the content of the syllabus in terms of type of materials and testing sequence is presented in Table 2-1.

INSTRUCTIONAL MATERIALS DEVELOPMENT

The instructional materials developed to train the candidate pilot in the PASS syllabus maneuvers can be divided into precockpit and in-cockpit training. Additional training materials were also developed to help the console operator in PASS procedures. The precockpit materials include programmed texts on basic helicopter flight instrumentation and VOR tracking. In-cockpit materials include student guides for each training session and the narrative script presented via the cockpit audio network. PASS console operation materials consist of a console operator handbook used by the console operator in directing and monitoring candidates through the PASS training. The following section describes the rationale for inclusion of each of these instructional packages and how each package was developed.

Precockpit Instruction. A presimulator-training, programmed instructional text was developed to help familiarize the PASS subject with the location and function of the UH-1 helicopter controls and instruments. This was a departure from the proposed instructional plan which required that all training be conducted in the cockpit. It was felt to be a necessary modification for two reasons. First, the complexity of the UH-1FS cockpit configuration and instrument panel

TABLE 2-1

BASIC OUTLINE OF THE SYLLABUS

SESSION ONE

- Programmed Instructional Text - Introduction to Basic Flight Instruments
- Precockpit Instruction
- Instruction, Demonstration, and Practice - Use of the Basic Flight Instruments and Controls
- Instruction and Practice - Straight and Level Flight and Straight and Level Flight with Rough Air
- Instruction and Practice in the Operation of the Side Task
- Testing of Straight and Level Flight with and without Rough Air and with and without the Side Task

SESSION TWO

- Review Test - Straight and Level Flight
- Instruction, Demonstration and Practice of Level Turns and a Normal Climb
- Testing of Straight and Level Flight, Level Turns and a Normal Climb with and without the Side Task

SESSION THREE

- Review Test
- Instruction Demonstration, and Practice of a Deceleration, Acceleration and Normal Descent
- Testing of Straight and Level Flight, Level Turns, a Normal Climb, Deceleration-Acceleration, and a Normal Descent, with Side Task

SESSION FOUR

- Review Test
- Instruction, Demonstration, and Practice of Climbing and Descending Turns
- Testing of Straight and Level Flight, Level Turns, a Normal Climb, Deceleration-Acceleration, a Normal Descent, Climbing and Descending Turns, with Side Task

SESSION FIVE

- Review Test - Climbing and Descending Turns
- Instruction and Practice of VOR Tracking
- Testing of Straight and Level Flight, Level Turns, a Normal Climb, a Normal Descent, and Climbing and Descending Turns

would make the task of locating the instruments and controls by audio-instruction only very difficult, requiring a large expenditure of valuable UH-1FS cockpit time. Second, the absence of visuals to accompany the audio instruction on instrument function might have created a confusion or distortion concerning individual instrument reading. For example, a flight naive individual may experience difficulty interpreting the attitude indicator's displays. Without the opportunity to ask questions or review the instruction on the attitude indicator, he/she may be hindered in performing flight tasks involving the attitude indicator.

The programmed instructional text utilizes a modified linear program which presents information in a fairly large chunk called a block. Each block consists of approximately six paragraphs of fifty words each. Questions covering the major objective of each block are included at the end of each block and a review test is given at the end of the text. It was hoped that this technique of providing large chunks of information followed by a sequence of questions may have helped alleviate some of the disadvantages encountered when developing linear programs for the intelligent and educated user. Typically, in a linear program, information is presented to the student in very small steps called frames. The maximum number of words in a frame usually does not exceed 25 to 30 words. For the intelligent and educated student who is accustomed to handling larger chunks of information, these small steps mean needless repetition of facts and, as Callendar (1969)[2] points out, produces a sense of boredom, lack of interest and fatigue.

A second text entitled "VOR tracking" was developed to precede Session Five PASS training in the UH-1FS. The mechanics of the VOR tracking task (course indicator, station passage, radials, etc.) that is taught in Session Five were thought to be too complex to be understood through the audio training alone. A supplemental precockpit guide for Session One was also developed to assist the student in learning the UH-1FS specific procedures. "VOR tracking" and the supplemental precockpit guide are for information purposes only and were not developed in the programmed instruction format.

Both the programmed instruction text and the VOR tracking pamphlet underwent numerous critical reviews for both content validation and for instructional adequacy by subject matter experts, flight naive students, pilots and contracting and contractor personnel, before submittal to final print. The PASS precockpit instruction and review test are included in Appendix B. The VOR tracking text is included in Appendix C.

In-Cockpit Instructional Materials. All instruction required for systems operation and performance of flight tasks is presented automatically through the UH-1FS Crown audio instruction system. Narrative scripts were developed for each session that described the series of activities involved in flying each specific maneuver in the learning sample as well as the interpretation and use of the instrument displays and controls, their interdependencies and their relationship to maneuver requirements. These oral instructions are "illustrated" by demonstrations of control movement tasks and flight maneuvers that are flown by the simulator's autopilot function under computer control. For example, the instruction on the

[2]Callendar, P. Programmed Learning - Its Development and Structure. London: Songmans, Green and Company, 1969.

relationship between the cyclic and the attitude indicator includes demonstrations of the effects of fore, aft, and side-to-side cyclic movements on the attitude indicator. During these demonstrations the PASS candidate is instructed to place his/her right hand on the cyclic, left hand on the collective, feet on the pedals and to watch the instruments.

In developing the audio tapes, the PASS RWAT candidate population was assumed to be completely naive with regard to the dynamics of flight, flying, helicopters and simulators. The script writers, too, for the most part, were naive with respect to helicopters and rotary wing flight instruction. This approach was used because it was felt that rotary wing flight naive scriptwriters were less likely than a flight experienced person to make the error of assuming that the PASS candidate knew more about flying than he/she actually did. Additionally, the flight naive scriptwriters may recognize instructional areas when the PASS candidate may experience difficulty and thus be able to expand on those areas, with the principle that those concepts, instruments, and maneuvers that were most difficult to understand by the flight naive scriptwriter may be the most difficult for the flight naive PASS candidate. This last point is especially critical to the PASS situation because in the automatic training and testing mode, the PASS candidate is not able to review or ask questions.

The sequence of script development proceeded as follows: First a basic outline of the syllabus was prepared by the PASS development team after consultation with rotary wing instructor pilots and UH-1FS personnel. The basic outline included the specifications of the maneuvers to be performed and their sequence in each training session; the performance parameters associated with each maneuver and the tolerance units for acceptable performance for each parameter; and the general pattern of instruction, practice and testing to be followed for each session.

Second, upon approval of the basic syllabus outline, individual maneuver profiles were developed. The maneuver profiles consisted of time-line analyses of all maneuvers into transition zones and steady states and identified the instrument parameters associated with each transition and steady state segment. These maneuver profiles are presented in Appendix A.

Third, as the script for each session was completed, it underwent critical reviews for content validation by subject matter experts. However, it was not until the software development was completed for each session that flight naive students and experienced pilots were able to evaluate the training effectiveness and adequacy of each session. Modifications to maneuver timing, sequencing, flight parameter boundaries, and narrative scripts were made after every system evaluation and try-out. A major modification to the training sequence occurred during the ninth month of the contract when it was decided to repeat the previous day's testing session at the beginning of each new session. The original sequence included a review and practice of the previous day's maneuvers followed by instruction of new maneuvers and testing. Front end testing as called out by the new sequence permitted a measure of retention to be included within the data analysis.

The complete scripts for Sessions One through Five are included in Appendix D.

Additional in-cockpit materials consist of student guides, one for each session, that are used by the PASS RWAT candidate as reference information during UH-1FS training and testing. These guides were developed primarily to help the

student determine whether or not the instruction was in the correct sequence. It was learned during the formative evaluations of the total PASS program that the audio tape recorder may skip or repeat instruction sequences. Since this was an unavoidable hardware problem, it was decided that PASS candidates need a training guide so that they can notify the console operator of the sequence problem. Parameter values of instruments relevant to a maneuver are also included in the student guides as a check for the PASS candidate. These student guides are included in Appendix F.

PASS Console Operator Instruction. Within the PASS program, the role of the console operator is to direct students to their assigned cockpits, assist in student UH-1FS orientation, set the initial conditions for each session, monitor the operation of the system and operate the console within the PASS program constraints. Since PASS operational requirements departed from the usual UH-1FS routine, a handbook was developed that described the PASS system and the console operator's role. This handbook is included in Appendix E.

PERFORMANCE FEEDBACK

The feedback concept used for the PASS program was based upon an analysis of the type of feedback usually provided by an instructor in flight training. This feedback can be categorized into four general classes:

1. Anticipatory type feedback aimed at reminding or "prompting" the candidate to take some corrective action to prevent the occurrence of an out-of-tolerance condition, e.g., "You're starting to climb!", or "Look at your bank angle!"

2. Status type feedback on the existence of out-of-tolerance conditions, e.g., "Your altitude is 200 feet too low!", or "You're turning at six degrees a second!"

3. "Crash" prevention type feedback in conjunction with a freeze of the simulator controls by the computer when conditions exist that, if continued, may produce a crash.

4. Evaluative type feedback on the candidate's performance after the maneuver or test is completed, e.g., "You controlled your turn well, but you forgot about airspeed."

These four classes of feedback are provided by the PASS program. However, due to limitation on software and hardware capabilities, coupled with the requirements for message standardization, feedback messages are provided in a somewhat simplified form and according to very strict rules of presentation. Feedback classes 1, 2 and 3 are presented via an auditory system using a VOTRAX voice synthesizer. Class 4, the evaluative type feedback, is presented via the CRT visual display used in UH-1FS training.

Before describing these messages and displays and their application, the techniques for the determination of proper performance values should be noted. Anticipatory and out-of-tolerance feedback classes required a set of values which

differentiate proper (in tolerance) performance from improper (out-of-tolerance) performance. RWAT UH-1FS syllabus performance parameters were examined and found to be too demanding for a flight naive student in as sensitive a control environment as that found in the UH-1FS. Thus, the school solution parameters were used for the anticipatory messages and, in all cases, the out-of-tolerance values were based on a factor of 50% more of the anticipatory value.

Anticipatory Feedback. Anticipatory type feedback consists of cautionary messages or prompts which inform the candidate that his/her performance on a given parameter is such that, unless immediately corrected, he/she will exceed the performance limits specified for that maneuver. All such cautionary messages are provided by the auditory feedback system. All auditory messages are generated under computer control to indicate which instrument or instruments, i.e., airspeed, vertical speed, heading, altitude, bank angle, side slip are out of the specified tolerances.

The structuring of each message is as succinct as possible to eliminate confusion and prevent ambiguity. For example, assume that a candidate is required to fly straight and level at a nominal altitude of 2000 feet with no greater than 150 feet deviation. Should the candidate reach an altitude of 2100 feet, then the message, "Check altitude," would be provided. Such messages provide specific prompts as to performance.

All instruments and their associated anticipatory feedback messages are shown in Table 2-2. It should be noted that the specified values remain constant during

TABLE 2-2

ANTICIPATORY FEEDBACK MESSAGES

Instrument	Deviation	Feedback Message
Altimeter	± 75 ft	Check altitude
Vertical Speed (for climb)	± 100 ft/min	Check climb rate
Vertical Speed (for descent)	± 100 ft/min	Check descent rate
Airspeed	± 7 Kias	Check airspeed
Bank Angle	± 7°	Check bank
Side Slip	± 1/2 ball	Check the ball
Heading	± 8°	Check heading
Course Indicator	± 2°	Check the course

all sessions as any changes would have prevented reliability determination. Further, a fixed interval between successive feedback messages of approximately 10 seconds was required to give the candidates time to make necessary corrections. The immediate repetition of messages would have done little to aid in correction and could have caused computer timing to be affected.

Additionally, there is another type of anticipatory messages or prompts which serve as reminders to initiate an action. The transition segment prompts are: Begin Left Turn, Begin Right Turn, Begin Climb, Begin Descent, Begin Climbing Turn, Begin Descending Turn, Begin Deceleration, Begin Acceleration, and Begin VOR Tracking. In order to further understand the timing, placement and presentation cues refer to Appendix A, Maneuver Profiles.

Out-of-Tolerance Feedback. The out-of-tolerance messages for presenting status type feedback inform the candidate when the value of any of the flight parameters which he/she is required to control reach or exceed the performance standards specified for that parameter. All such out-of-tolerance messages are provided by the auditory feedback system. Auditory out-of-tolerance messages are presented in Table 2-3.

TABLE 2-3

OUT-OF-TOLERANCE FEEDBACK MESSAGES

Instrument	Deviation	Feedback Message
Altimeter	+150 ft	Altitude too high
	-150 ft	Altitude too low
Vertical Speed (for climb)	+200 ft/min	Climbing too fast
	-200 ft/min	Climbing too slow
Vertical Speed (for descent)	+200 ft/min	Descending too fast
	-200 ft/min	Descending too slow
Airspeed	+15 KIAS	Airspeed too fast
	-15 KIAS	Airspeed too slow
Heading	+16°	Heading too far right
	-16°	Heading too far left
Bank Angle	+15°	Bank too steep
	-15°	Bank too shallow
Side Slip	± 1 ball	Watch the ball
Course Indicator	+4°	Tracking too far right
	-4°	Tracking too far left

"Crash Prevention" Feedback. When the candidate approaches an out-of-control situation during a practice session of a maneuver, the computer freezes all motion and resets the controls and instruments to the beginning of the maneuver's command values and conditions. At the same time, the candidate receives a message informing him/her of which performance parameter(s) is unacceptable and places him/her in a reset mode. Unacceptable performance values were set arbitrarily by multiplying the out-of-tolerance message values by two. Although these values do not approach the crash parameters of the UH-1 aircraft, they do reflect conditions under which the naive candidate may experience difficulty in bringing his/her helicopter back into in-tolerance conditions. However, the reset mode is utilized only during practice sessions. Crash prevention feedback messages are presented in Table 2-4.

TABLE 2-4

CRASH PREVENTION FEEDBACK MESSAGES

Instrument	Deviation	Feedback Message
Altimeter	± 300 ft	Altitude unacceptable
Vertical Speed (for climb)	± 400 ft/min	Climb rate unacceptable
Vertical Speed (for descent)	± 400 ft/min	Descent rate unacceptable
Airspeed	± 30 KIAS	Airspeed unacceptable
Heading	± 32°	Heading unacceptable
Bank Angle	± 30°	Bank unacceptable
Course Indicator	± 8°	Course unacceptable

Feedback messages are presented in their order of importance. If a "Check" message and an out-of-tolerance message are in queue at the same time, the Out-of-Tolerance will take precedence over the "Check" message.

Performance History Display. At the end of each maneuver, the candidate was presented with a history of performance for key flight parameters. The key parameters include altitude, airspeed and ground track. Additionally, out-of-tolerance conditions by parameter were noted. This information was displayed on a CRT screen located behind and to the left of the student's seat in the cockpit. The performance history visual display used for this program is the same display used currently in UH-1FS auto-training.

PERFORMANCE MEASURES

Raw performance data were continuously sampled and stored on flight parameters, control movements and communication side task responses during each session's testing sequence. Table 2-5 presents a listing of the performance measures collected and the frequency of sample rates. These data were stored onto the disks during data collection; and at the end of the testing session, they were dumped onto tape. The data on tape were then available for retrieval and data analysis at any time. Data analysis, however, was not within the scope of this program. Refer to the Software Description section of this report for a further discussion of the data collection.

TABLE 2-5

SAMPLE RATE OF DATA COLLECTION

Pitch	1 every second
Roll	1 every second
Yaw	1 every 2 seconds
Stick Movement (Lateral)	2 every second
Stick Movement (Longitudinal)	2 every second
Pedals	1 every second
Power (Pounds Torque)	1 every 2 seconds
Altitude	1 every 2 seconds
Airspeed	1 every 2 seconds
Heading	1 every 2 seconds
Vertical Speed	1 every 2 seconds
Course Deviation	1 every 2 seconds
Side Task	Frequency select time
Side Task	Microphone key response time

SECTION 3

PASS SOFTWARE DEVELOPMENT

IMPLEMENTATION

PASS system implementation was accomplished using the bulk of the modules contained in existing training load within the #2 516 computer. Auto training modules which schedule input data (segments of 50 words) for aircraft parameter references and control commands were used to execute the selection syllabus. A utility program (Problem Formulation Assembler) was employed to construct the problem data using maneuver profiles as a guide. Some of the data within the segment profiler took on new meaning for selection as original training requirements were lost. A sample segment profiler lists the type of information stored for each one of the segments, and a definition of information is included in Table 3-1, Appendix G.

MODULE DEVELOPMENT

Modules which were developed, altered and removed are discussed below:

VOTRAX Message Handler. Audio feedback and side task messages for all four cockpits are controlled for output by the message handler. First, output instructions were developed for the individual VOTRAXs; then, if the VOTRAXs were not busy, the message timers had elapsed and a message was in queue, information was directed to the VOTRAX under computer direct multiplex control (DMC). It was released for presentation upon completion of transfer.

Audio Alerts Feedback. Audio messages were packed in core in octal form, that is, one phoneme per computer word preceded by a computer word representing the number of phonemes in a message. An address list served as a pointer to select a particular message. Messages were ordered according to parameter type and by degree within type. Command for a particular type or types was derived from a segment word in the TEB (this event buffer). When an aircraft parameter value versus command value became separated by a given delta, the alert message pointer by type and degree was calculated and placed in queue for output. The message type priority was changed by rotating the segment word in the TEB after any type had been presented.

Side Task - The side task consisted of a VOTRAX direction to the subject to select one of several positions from the preset channel knob on the UHF ratio and respond with a communication check. Software monitored the station setting and the comm button for responses. Scoring was based upon time-to-respond as well as completion/noncompletion of tasks. If the subject did not respond correctly upon completion of the sequence, he was redirected with one repeat of the message after ten seconds. Each successive direction for the side task commanded a different setting requirement. Command for the side task was derived from a segment word in the TEB. If other VOTRAX messages (alerts) were in the process of being spoken, the side task direction was delayed until the alert was completed.

Data Collection - The data collection technique was changed from the original plan of writing data in real time directly from a buffer to magnetic tape to directing the data to the online disk. This method was used for conservation of time as the disk was faster than the magnetic tape in responding to computer action.

During a test period data were gathered on a cockpit basis in raw form at variable rates, over a two second period, in the form of a logical record. After the two second collection, the data records were transferred to an output buffer holding 10 logical records. After 20 seconds, this buffer was output to disk as a physical record. Each disk track would allow six records (or 2 minutes) of time history data (see Table 3-2, Appendix B, for the data picture).

Data Management. After a session was completed for all four cockpits, the data gathered on the disk were spooled to magnetic tape via the Data Management Program. These data were again in raw form as they had been collected in real time for the disk. This tape record matches the disk physical record. When the spooling process was complete, a TTY (teletype) bell rang signalling that an operator could dismount the tape from the tape unit and enter it as input for data analysis.

See Appendix G for math flows for above modules.

General Information. Program modules were removed to allow space for the new module development, or for buffer space for data transfer to peripherals. Other modules had to be modified to implement functions needed by PASS, e.g., recycle capability during practice unacceptable conditions and during testing when sequences were being repeated or forcing end conditions by time or other requirement. The data dictionary was also modified to allow new permanent variables and Booleans required in program execution.

Load Module and Data Creation. Source decks for the #2 computer system, including Auto training, rotor, and display modules. A BOS (Basic Operating System) disk was generated to operate upon the source files. Using the UH-1FS Device #1, which has a card reader and a line printer peripherals, the source input was assembled using the BOS assembler. Listings of the assemblies were output as well as object paper tapes. The paper tapes were then read to create a load module, which in turn, was stored for permanent use on an operational disk. This operational disk also contains utility programs to control loading of programs and the problem formulation assembler to create the syllabus problem data in segment form. Profiler listings of these data are also available at the UH-1FS site.

SECTION 4

PASS HARDWARE COMPONENTS

SUMMARY OF PASS HARDWARE COMPONENTS

The hardware requirements for the reconfiguration of the simulator device were dictated by the need for a quick-response, voice feedback capability. This need was satisfied by the ML-1 VOTRAX voice synthesizer. It is a multi-lingual capability voice system which produces electronically synthesized speech from digital inputs supplied by the computer. All hardware supplied and installed by McDonnell Douglas was required to interface the four VOTRAX units to the Honeywell DDP-516 Computer and to the cockpit headphone audio system. The required components were four ML-1 VOTRAX voice synthesizers, four Honeywell parallel output channels, an audio switching junction box and all of the associated interconnection cables. All references to Appendix H of this document refer to the Hardware Reconfiguration Document submitted to ARI on 3 January 1978.

VOICE SYNTHESIZER

The Model ML-1E-1920-1949 VOTRAX units were purchased from the Vocal Interface Division of Federal Screw Works, Troy, Michigan. The units have a parallel first in - first out (FIFO) buffered interface with a buffer capacity of 64 characters or phonemes. Information describing the interface control signals, schematics and connector pin assignments can be found in Appendix H.

HONEYWELL PARALLEL OUTPUT CHANNELS

The interfacing of the VOTRAX voice synthesizers to the DDP-516 computer was handled by the installation of a new option drawer containing four Model 516-33 parallel output channels (POCS). This drawer was mounted in System #1 cabinet, but it was connected to power and the Input/Output (I/O) and Direct Multiplex Control (DMC) control buses of System #2. The drawer contained some additional circuitry required to provide full compatibility between the POCS and the voice synthesizers. The assembled drawer, all circuitry and wiring inside the drawer, and the interconnection cables were purchased from Boudreau Consulting of Holliston, Massachusetts. Schematics, wire lists, cable drawings and interconnection diagrams can be found in Appendix H.

COCKPIT AUDIO SWITCHING

Connection of the VOTRAX audio into the cockpit headphone system was accomplished at the cabinet containing the Crown tape recorders. A switched audio junction box was used to facilitate the changeover from training use to selection use and back again. The drawings for the audio junction box are found in Appendix H.

The VOTRAX voice synthesizers were linked to the computer interface by 50-foot cables and to the cockpit audio by 50-foot twisted pair cables. The completed installation provided almost instantaneous audio feedback and instructional messages required by the selection system.

SECTION 5

OPERATIONAL FEASIBILITY DEMONSTRATION

OPERATIONAL FEASIBILITY DEMONSTRATION

An operational demonstration of the PASS was conducted during the week of 23 January 1978. Twenty-two individuals, eleven RWAT candidates and eleven instructor pilots, participated in the demonstration. All twenty-two subjects completed each of the five PASS testing sessions. Additionally, the eleven RWAT candidates studied the precockpit instructional texts and completed the revised FAST test. Of the eleven RWAT candidates, five flew the UH-1FS device utilizing the five degree of freedom motion-base configuration, and six flew it without the motion. Five of the instructor pilots were on motion, and six were off motion. All subjects completed the five PASS sessions in the cockpit originally assigned to them.

Questionnaires completed by the RWAT candidates and the experienced pilots indicated that five of the ten candidates who completed the form had previous fixed wing flying experience, ranging from 40 to 280 hours. Three possessed private pilot licenses, and one held commercial and instrument rating licenses. No one indicated previous rotary wing flight experience. Two of the RWAT candidates were warrant officer candidates, and the remainder were commissioned officers.

The rotary wing flight experience of the eleven experienced pilots who completed the form ranged from 120 hours to 6000 hours rotary wing flight time. Additionally, six listed fixed wing flight time of from 27 to 5000 hours. One of the experienced pilots was a civilian Army rotary wing instructor pilot while the remainder were Army commissioned officers or warrant officers. Two of the experienced pilots were instructor pilots in the TH-55A, one was an instructor pilot in the UH-1H and UH-1FS, four flew the UH-1H, two the OH-58A and one the CH-47. This indicates that approximately half of the experienced pilots customarily flew under visual flight conditions.

The operational demonstration was successful. Twenty-two one hour sessions a day for five days were completed, and test data were collected and stored on disks and transferred to magnetic tape for analysis. All sessions ran smoothly except for minor equipment problems. The problems encountered were not PASS training induced problems but were hardware problems experienced by all areas of this simulator system. These problems were: fifteen recorded failures to reset to initial conditions after unacceptable performance, twenty-six instances involving the Crown audio tape losing synchronization with the training sequence, six VOTRAX message transmittal failures, four VARIAN computer failures, one instance of a blown cockpit circuit breaker, and one instance of losing control of the cockpit while on motion during reset in the "auto" training mode producing an erratic, bucking movement. There were several instances of complaints by the instructor pilots that the cockpit instrument displays did not match the computer instrument reading resulting in erroneous performance feedback messages. All of these aforementioned problems, except for instrument display discrepancies, were easily corrected and interfered only slightly with PASS training. The instrumental display discrepancy problem was found to be a result of the amount of tolerance a cockpit instrument was allowed to vary from the computer command. The only viable solution for PASS training was to expand the performance parameters. Additionally, there were four instances of total power failures and one system shutdown because of an overheating problem. The power failures and the system

shutdown did interfere with PASS training and were completely beyond the control of the PASS system designers. It has not been determined at this time whether any data were lost because of the power failures.

As of the date of this report, the data analysis is in progress. However, observations of post-maneuver performance records of attitude, airspeed, and ground track displayed on the CRT screen at the console indicate that the PASS probably does differentiate between the experienced and inexperienced aviator.

A debriefing questionnaire was distributed to both the experienced pilots and the RWAT candidates at the end of the fifth session. Questions included overall opinions of the PASS, the utility of PASS in selecting students for flight school, difficulty level of the PASS training sessions, and critical evaluations of each session. Overall, responses from both the experienced pilots and the RWAT candidates were favorable. All of the candidates and most of the experienced pilots felt that the PASS would be a very effective tool in selecting students for flight school. Twenty percent expressed unconcern that those individuals with previous flight experience may have a decided edge over those without flight experience.

In response to a question of how useful the PASS program would be in selecting students to fly in the aircraft to which they were currently assigned, 66 percent of the experienced pilots thought that it might be helpful. Those that thought it would not were primarily those who were assigned to aircraft that were not instrumented and viewed the PASS as an instrument flight training program. One of the TH-55A instructor pilots (the TH-55A is a basic visual flight helicopter trainer) thought it would be useful because he saw the PASS as measuring basic airmanship skills rather than the ability to fly under instrument conditions.

With respect to difficulty level, most of the RWAT candidates stated that the VOR tracking task was too difficult, but manageable, and felt that the progression of easy to increasingly more difficult tasks was challenging. Many expressed a desire for more practice time for each maneuver. The experienced pilots thought the flight parameters were too stringent for the flight naive pilot but that the instruction was adequate for the inexperienced person in the PASS flight tasks. Many of the experienced pilots and RWAT candidates indicated that they thought that all RWAT applicants should fly the PASS program "on motion" though a few recognized that the no-motion condition may be harder to fly.

Recommendations for improvement included eliminating the VOR tracking task, expanding the flight parameter limits, increasing practice time and allowing all applicants to fly part of the time on motion.

Console operators also completed a debriefing questionnaire regarding the PASS from the operator's viewpoint. All felt that the PASS program was relatively easy to administer and monitor. Their only recommendation was to include all of the segments and setup points along with a copy of the scripts in the PASS Operator's Handbook.

SECTION 6

SUGGESTED PRODUCT IMPROVEMENT AREAS

SUGGESTED PRODUCT IMPROVEMENT AREAS

Several desirable PASS system modifications became apparent as the PASS implementation proceeded. The operational capability of the device could be optimized so that the upper limits would be only those de facto constraints of the UH-1FS configuration; these constraints ultimately determine whether or not these suggested product improvement concepts can be successfully implemented.

Samples of the major items of PASS system modification are discussed below in a generic framework with the associated benefits:

*Additional Side-Task Implementation. To augment the existing UHF radio communications side-task, it is proposed to implement one additional audio or visual cue as a control function, (i.e., select the "press to test" fire warning circuit. This cue could be implemented while in a maneuver requiring use of collective and cyclic controls. The requirement to select the communications side-task is a representative operational task and increases the pilot workload. If an additional side-task were inserted into this set of conditions, the additional loading and demands on selective attention may show significant behavioral trends to supplement the pilot selection process and operational suitability assessment.

*Training Data Recording. Significant to the operational capability demonstration was the likelihood that limited and selected simultaneous semi-auto mode non-PASS training in other cockpits of the selection device may be possible. If this prediction is valid, it is proposed that limited and selected training data collection may also be provided utilizing the PASS data collection system. Net result is more cost effective use of the PASS device.

*Unique Call Signs. The present PASS system selectively addresses all device cockpits as "Army 17." Proposed modification would provide differential identification of addressed cockpit by use of a unique call sign for that cockpit only. Net result would be to increase the demands placed upon the student by requiring him to listen selectively for his call sign in a limited signal to noise condition.

*Initialize/Reset Condition. Under a "reset" condition in a nontesting condition, the present PASS system may sense a differential between minimum and maximum torque values available to initialize the device. This situation could lead to minor random pitching and lateral motion of the cockpit if on motion. It is proposed that a positive software modification be implemented so that console operator monitoring and intervention would be a normal procedure to preclude this possibility. Net result - enhance safety and provide operational optimization.

Improved End-of-Run Display. The current PASS system provides only altitude, airspeed, and ground track history, for a limited time period. It is recommended that other flight parameters of interest be enabled with clearer or expanded definition for longer periods so that flight parameter/time histories can be more closely correlated to other data sources. Net result - better and more precise performance history feedback to the student.

*Items selected for PASS modification - refer to Appendix N.

*Replace/Eliminate VOR Tracking (Session 5). Based on subject (IP and candidate) feedback from the concept feasibility demonstration, it appears that the testing time allocated for VOR might be better utilized. (IPs had no problem with VOR; candidates experienced some difficulty, although all IPs and candidates completed the VOR task). Since VOR is by definition an instrument procedure, a reallocation of the time for Session 5 providing more testing or related existing maneuvers might be more predictive and more time-effective for "naive" pilot selection.

*Continuous Performance Measurement. Currently data collection/performance measurement is enabled only during session testing due to system limitations. Performance during practice sessions prior to testing could be of high value for selection and prediction. It is proposed to rebalance the frames to permit data collection during practice. Net result - a better measure of rates of learning for repeated practice.

PASS Syllabus Reconfiguration. Current PASS operational requirements dictate intervention by the console operator for testing sequence insertion on Sessions 2, 3, and 4. This method was selected on a cost-benefit basis. Total reconfiguration of all sessions would be costly; reconfiguration of Sessions 2, 3, and 4 would provide a more optimal approach to enhance operational efficiency. In the case where total reconfiguration was selected, Session 5 VOR tracking would be deleted to provide additional testing.

Replace Crown Audio System with VOTRAX and Programmed Text - Approximately 95% of the difficulties encountered during the PASS development and operational tryouts can be attributed to problems inherent in the Crown audio-tape system. These problems are not new to the UH-1FS auto-training programs and may well continue to plague the operational PASS as well. It is recommended to bypass the Crown tape system and utilize the VOTRAX voice synthesizer combined with printed materials as the major vehicle for instructional control and presentation. This proposal would require an extensive modification to both the software and the syllabus. Other alternatives, such as using a micro- or mini-computer, may be easier to implement but would also require additional hardware to the UH-1FS configuration.

*Items selected for PASS modification - refer to Appendix N.

SECTION 7

REFERENCES

REFERENCES

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Long, G. E. and Varney, N. C. The Automated Pilot Aptitude Measurement System (APAMS). Lackland AFB: Air Force Human Resources Laboratory, September 1975.

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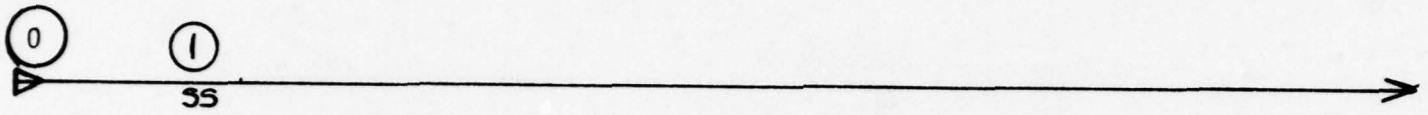
APPENDIX A

MANEUVER PROFILES

MANEUVER PROFILE 1.0

Straight and Level



SS - STEADY STATE

Initial Conditions:

090°
90 KIAS
2000' MSL
24# Collective Pitch

All other values 0

Maneuver Description:
(Objective)

Starting at an altitude of 2000', 90 KIAS and 090° heading, maintain straight and level coordinated flight with constant altitude, airspeed and heading for two minutes. Straight and level flight with rough air will use turbulence level of 4.

SEGMENT 1.0 - Page 2

Maneuver Segments:

Segment 0 - Initial conditions are set. "Continue" Button is illuminated.

Start on Initialize (Initial Conditions)

End of "Continue" Button depress

Go to Segment 1

Segment 1 - Steady State. Maintain straight and level flight.

Start on "End" Segment 0

End on Time -

PERFORMANCE LIMITS	COMMAND	"CHECK" 1	"OUT OF TOLERANCE" 2	RESET 3
Airspeed	90 KIAS	± 7K	± 15K	± 30K
Altitude	2000' MSL	± 75'	± 150'	± 300'
Heading	090°	± 8°	± 16°	± 32°

(Command values same as initial conditions for this maneuver.) Normal feedback and reset apply.

Go to end of problem

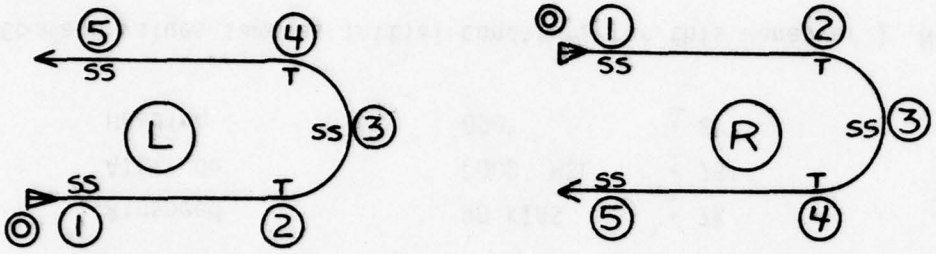
This terminates the maneuver

Cum time = 2.0 min.

NOTE: maneuver time varies.

MANEUVER PROFILE 2.0

MANEUVER: Level Turns (180°)



SS - STEADY STATE
T - TRANSITION

MANEUVER DESCRIPTION: (Objective)

Starting at an altitude of 2000', 090° heading, 90 KIAS, maintain straight and level flight for 10-120 sec. When instructed to start the 180°turn (L or R) roll smoothly into the (R or L) turn and establish a bank angle of 16°. Maintain this bank angle in the turn while holding altitude at 2000' and airspeed at 90 KIAS. Plan for a smooth rollout on the 270° heading. Maintain straight and level flight for 10 sec. This will terminate the maneuver. Be alert for corrective feedback messages during the maneuver.

MANEUVER PROFILE 2.0 - Page 2

INITIAL CONDITIONS: 090°
2000' MSL
90 KIAS
24# collective/pitch
0° yaw

All other values 0

MANEUVER SEGMENTS:

Segment 0 - Initial conditions are set. "Continue" button is illuminated.
Start on Initialize
End on "Continue" button depress

Go to Segment 1

Segment 1 - Steady State. Maintain straight and level for 5 sec. Enable normal feedback and reset provisions.
Start on Segment 0 End
End on Play Audio Message "Begin L/R Turn"
Play message at start (Segment 1) +5 sec

Normal Feedback Applies

PERFORMANCE LIMITS	COMMAND	"CHECK" 1	OUT OF TOLERANCE 2	RESET 3
Airspeed	90K	± 7K	± 15K	± 30K
Altitude	2000'	± 75'	± 150'	± 300'
Heading	090°	± 8°	± 16°	± 32°

Physical reset applies as maneuver is total steady state. If reset return to initialize (for practice sessions)

Go to Segment 2 (a)

Segment 2 (a) - Transition. When instructed, roll smoothly into a 16° right/left roll to establish a standard rate (3°/sec) turn with use of cyclic. Initially use the ADI for the entry.

Start on Segment 1 End

End on bank angle 7° or more (Right or Left) or 5 sec

OPTION { If 2 (a) End condition is not reached by Segment 2 (a) start +10 sec default to initialize. If roll is initiated wrong direction reset, return to Initialize. If roll exceeds 30° - reset, return to Initialize. }

Go to Segment 2 (b)

Segment 2 (b) - Establish a bank angle onthe ADI of 14-17°, cross check the TSI for a standard rate turn while maintaining altitude and airspeed.

Start on Segment 2 (a) End

End on bank angle 14-17° (L/R) or 5 sec

Go to Segment 3

Segment 3 - Steady State. Maintain a constant standard rate turn of 3°/sec L/R by holding a constant 14-17° bank angle. Maintain altitude and airspeed.

Start on Segment 2 (b) End or Segment 1 End +15 sec

End on 270° ± 7° or 75 sec

No feedback on heading; no physical reset on roll unless roll exceeds 30° R/L

PERFORMANCE LIMITS	COMMAND	"CHECK" 1	"OUT OF TOLERANCE" 2	RESET 3
Heading	090°←→270°	-	-	-
Airspeed	90 KIAS	± 7K	± 15K	± 30K
Altitude	2000' MSL	± 75'	± 150'	± 300'
Bank Angle	14-17° (L/R)	-	-	± 32°
YAW	0°			

Go to Segment 4 (a)

Segment 4 (a) - Transition. Approximately 7° before reaching 270° Heading (277°/263°) begin a smooth rollout to a level flight attitude on 270° heading.

Start on bank angle 15° ≤ 11°

End on bank angle 10° or less or 5 sec

No feedback.

Go to Segment 4 (b)

Segment 4 (b) - Transition. Roll out on heading 270° constant altitude and airspeed

Start on Segment 4 (a) End

End on 270° ±5 or 5 sec

Normal feedback on altitude

Go to Segment 5

Segment 5 - Steady State. Maintain straight and level 270°, 2000', 90 KIAS for 10 sec

Start on Segment 4 (b) End

End on start +10 sec

Use normal feedback for altitude, heading and airspeed

Physical reset applies in steady state.

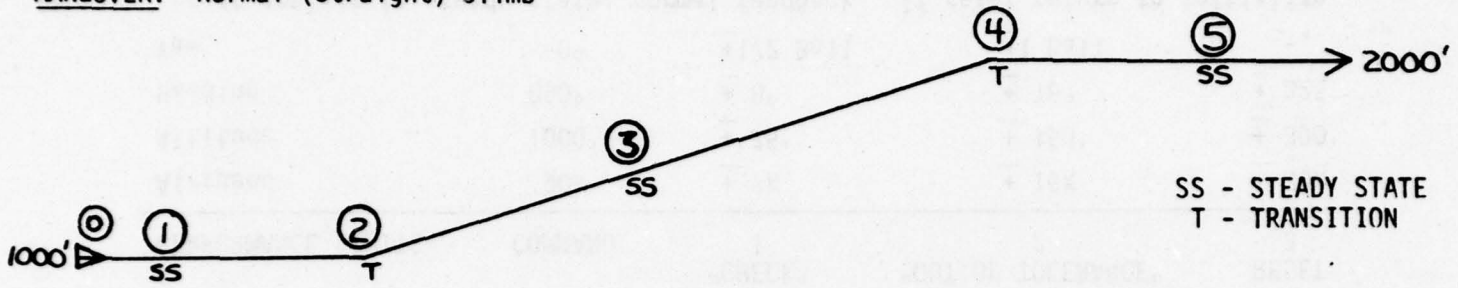
Go to End of Problem

This terminates the maneuver

Cumulative time - 2 min, 10 sec

MANEUVER PROFILE 3.0

MANEUVER: Normal (Straight) Climb



MANEUVER DESCRIPTION: (Objective) Starting at an altitude of 1000', 090" heading, 90 KIAS, maintain straight and level flight for 5 sec. When instructed, start a constant 500'/min rate of climb while holding a 090° heading and maintaining 90 KIAS. As you approach 2000' MSL, plan the transition to level flight at 2000' MSL, 090° heading and 90 KIAS. Maintain straight and level flight at 2000', 090°, 90 KIAS for 10 sec. This will terminate the maneuver. Be alert for corrective feedback messages during the maneuver.

INITIAL CONDITIONS:

090°
1000' MSL
90 KIAS
24# Collective/Pitch
0° Yaw

All other valves 0

MANEUVER PROFILE 3.0 - Page 2

MANEUVER SEGMENTS:

Segment 0 - Initial conditions are set. "Continue" Button is illuminated.

Start on Initialize

End on "Continue" Button depress

Go to Segment 1

Segment 1 - Steady State. Maintain straight and level for 5 sec. Enable normal feedback and reset conditions.

Start on Segment 0 End

End on play audio message "Begin Climb"

Message at start (Segment 1) +10 sec

PERFORMANCE LIMITS	COMMAND	"CHECK" 1	"OUT OF TOLERANCE" 2	RESET 3
Airspeed	90K	± 7K	± 15K	± 30K
Altitude	1000'	± 75'	± 150'	± 300'
Heading	090°	± 8°	± 16°	± 32°
Yaw	0°	±1/2 Ball	±1 Ball	-

Physical reset applies in steady state; normal feedback. If reset return to initialize.

Go to Segment 2 (a)

Segment 2 (a) - Transition. Smoothly increase collective/pitch to 29# when instructed to "Start Climb"

Start on Segment 1 End

End on torque pressure 27# or more or 5 sec

Go to Segment 2 (b)

Segment 2 (b) - Transition. Establish a 500 FPM climb by reference to the Altimeter and the vertical speed indicator while maintaining heading and airspeed.

Start on Segment 2 (a) end

End on vertical speed 400 fpm or segment 2 (b) +5 sec

Go to Segment 3

MANEUVER PROFILE 3.0 - Page 4

Segment 3 - Steady State. Maintain a constant rate 500'/min climb by use of vertical speed. Maintain heading and A/S.

Start on Segment 2 (b) end

End on 1950' altitude or greater or Segment 2 (b) End +140 sec.

PERFORMANCE LIMITS	COMMAND	"CHECK" 1	"OUT OF TOLERANCE" 2	RESET 3
Airspeed	90K	± 7K	± 15K	± 30K
Heading	090°	± 8°	± 16°	± 32°
Altitude - Increasing to 2000' at 500/fpm				
Vertical Speed 500 fpm	-	±100fpm	±200fpm	±400 fpm
Collective/Pitch 29#	-	-	-	-
Yaw	0	±1/2 Ball	±1 Ball	-
			Normal F/B on Heading and A/S	

Go to Segment 4 (a)

Segment 4 (a) - Transition. Observe altitude and when approaching 1950' begin transition from the climb to straight and level at 2000'

Start on Segment 3 End

End on 2000' or start +5 sec

Go to Segment 4 (b)

MANEUVER PROFILE 3.0 - Page 5

Segment 4 (b) - Transition. Smoothly reduce collective pitch to approx. 24# to maintain 2000', 090°, 90K

Start on Segment 4 (a) End

End on torque pressure 24# ± 1 or 5 sec

Go to Segment 5

Segment 5 - Steady State. Maintain straight and level 090°, 2000', 90 KIAS for 10 sec. If side task is used extend to 120 sec.

Start on Segment 4 (b) End

End on start (Segment 5) +10 sec

Use normal feedback for altitude, A/S and Heading and Yaw

Physical reset applies in steady state.

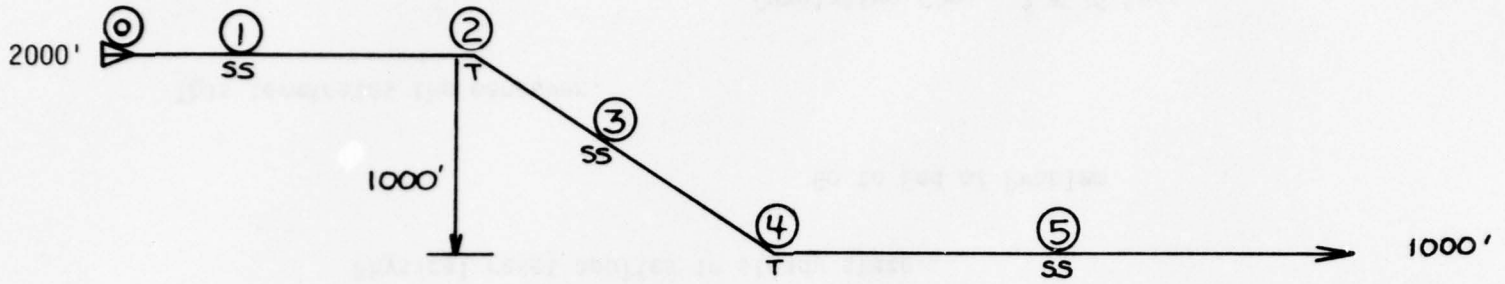
Go to End of Problem

This terminates the maneuver.

Cumulative time - 3 + 35 Secs

MANEUVER PROFILE 4.0

MANEUVER: Normal (straight) descent



MANEUVER DESCRIPTION: (OBJECTIVE)

Starting at an altitude of 2000' MSL, 090° heading, 90 KIAS - maintain straight and level flight for 5 sec. When instructed, smoothly start into a 500'/min rate of descent while maintaining a 090° heading and 90 KIAS. As you approach 1000' MSL slow your rate of descent and plan to transition to straight and level flight at 1000' MSL, 090° heading and 90 KIAS. Maintain straight and level flight 1000' MSL, 090°, 90 KIAS for 10 sec. This will terminate the maneuver. Be alert for corrective feedback messages during the maneuver.

SS - STEADY STATE
T - TRANSITION

INITIAL CONDITIONS:

090°

2000' MSL

90K

24# Collective pitch

Yaw - 0°

All other values 0

MANEUVER SEGMENTS:

Segment 0 - Initial conditions are set. "Continue" button is illuminated.

Start on Initialize

End on "Continue" button depress

Go to Segment 1

Segment 1 - Steady state. Maintain straight and level for 5 sec. Enable normal feedback and reset conditions.

Start on Segment 0 End

End on Play Audio MSQ "Begin Descent".

Message at start segment 1 + 16 sec.

Message at start segment 1 + 120 sec (with side task)

SEGMENT 1 (Continued)

Performance Limits	Command	Check 1	Out of Tol. 2	Reset 3
Airspeed	90K	±7K	±15K	±30K
Altitude	2000'MSL	±75'	±150'	±300'
Heading	090°	±8°	±16°	±32°
Yaw	0°	±1/2 Ball	±1 Ball	-

Reset applies in steady state, feedback normal. If reset return to initialize.

Go to Segment 2(a)

Segment 2(a) - Transition. Smoothly decrease collective/pitch to 19# when instructed to "Start descent".

Start on Segment 1 End

End on torque pressure 22# or less or 5 sec

Go to Segment 2(b)

Segment 2(b) - Transition. Establish a 500 fpm descent by reference to the altimeter and the vertical speed indicator while maintaining heading and airspeed.

Start on Segment 2(a) End or 1950' or less.

End on start 2(b) + 5 sec. or vertical speed -400 fpm

Go to Segment 3

Segment 3 - Steady state. Maintain a constant rate descent of 500 fpm by use of the vertical speed indicator. Maintain heading and airspeed.

Start on 2(b) End

End on 1050' or less or "Segment 1 end" + 140 sec.

Performance Limits	Command	"Check" 1	"Out of Tol" 2	"Reset" 3
Airspeed	90K	±7K	±15K	±30K
Altitude	Decreasing to 1000'	-	-	-
Heading	090°	±8°	±16°	±32°
Yaw	0"	±1/2 Ball	±1 Ball	-
Vertical Speed	500 FPM	±100'	±200'	±400'
Collective/Pitch	19#	-	-	-

Normal feedback on heading and airspeed and vertical speed.

Go to Segment 4(a)

Segment 4(a) - Transition. Observe altitude and when approaching 1050' begin transition from the descent to straight and level at 1000'.

Start on Segment 3 End

End on vertical speed 200 FPM or less or 5 sec.

No physical reset on altitude

Go to Segment 4(b)

Segment 4(b) - Transition. Smoothly increase collective/pitch to 24# to maintain 1000', 090°, 90K.

Start on Segment 4(a) End

End on 24# (I1) torque pressure + 5 sec.

Go to Segment 5

SEGMENT 5 - Steady state. Maintain straight and level 090°, 1000', 90 KIAS for 10 sec.

Start on Segment 4(b) End

End on start (Segment 5) + 10 sec.

Use normal feedback for Alt, Heading and A/S. Physical reset applies in steady state

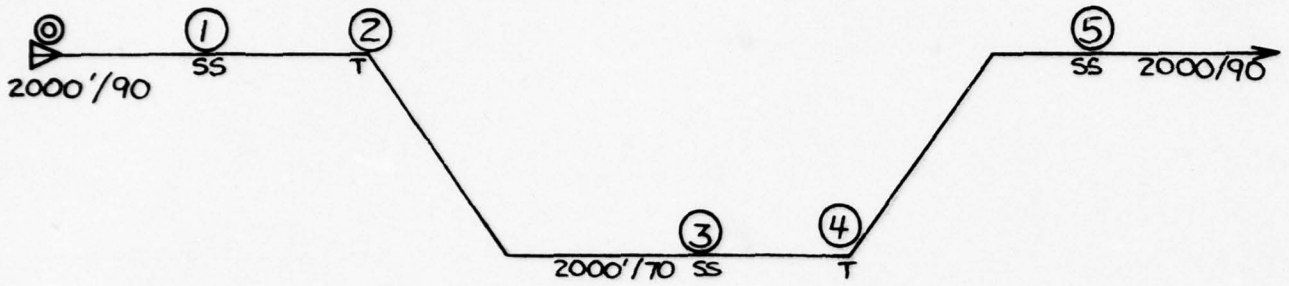
Go to end of problem.

This terminates the maneuver

Cumulative time 3.0 min. + 35 sec.

MANEUVER PROFILE 5.0

MANEUVER: DECELERATION/ACCELERATION



Maneuver Description:
(Objective)

Starting at an altitude of 2000' MSL; 090° heading and 90 KIAS - maintain straight and level flight for 5 sec. When instructed, smoothly reduce collective/pitch to 20# to decelerate to 70 KIAS while maintaining 2000' MSL and 090° heading by use of cyclic. Upon reaching a stabilized airspeed of 70 KIAS, maintain straight and level flight for 30 sec. When instructed, smoothly increase collective/pitch to 24# to establish 90 KIAS while maintaining 2000' MSL and 090° heading by use of cyclic. When reaching 90 KIAS maintain level flight for 10 sec. This will terminate the maneuver. Be alert for corrective feedback messages during the maneuver.

SS - STEADY STATE
T - TRANSITION

Initial Conditions:

090°
90 KIAS
2000' MSL
24# Collective Pitch
0° Yaw

All other values 0

Maneuver Segments:

Segment 0 - Initial conditions are set. "Continue" Button is illuminated.
Start on Initialize
End on "Continue" Button depress

Go to Segment 1

Segment 1 - Steady State. Maintain straight and level for 5 sec. If communications task is used extend to 120 sec. Enable normal feedback and reset conditions.
Start on Segment 0 End
End on play audio message "START DECELERATION" + 5 sec.

PERFORMANCE LIMITS	COMMAND	"CHECK" 1	"OUT OF TOLERANCE" 2	RESET 3
Airspeed	90 KIAS	± 7K	± 15K	± 30K
Altitude	2000'	± 75'	± 150'	± 300'
Heading	090°	±8°	±16°	±32°
Yaw	0°	± 1/2 ball	± 1 ball	- -
Torque	24#			

Reset applies in steady state. If reset return to initialize.
Go to Segment 2 (a).

Segment 2(a) - Transition. When instructed, smoothly decrease collective/pitch to 20# to start deceleration to 70 KIAS.

Start on Segment 1 End
End on torque pressure 22# or less or 10 sec
No Feedback on airspeed
Feedback on Altitude, Heading and Yaw
Go to Segment 2 (b)

Segment 2(b) - Transition. Use small aft cyclic to maintain altitude and heading while airspeed decreases to 70K.

Start on Segment 2(a) END
END on 70 KIAS ±3K or 10 sec
Feedback on Altitude, Heading and Yaw
Go to Segment 3

Segment 3 - Steady state. Maintain straight and level 70 KIAS, 2000' and 090° for 30 sec.

Start on Segment 2(b) END
END on start (Segment 3) +30 (play audio message "START ACCELERATION" here)
Reset conditions of STEADY STATE apply
Feedback on Altitude, Heading and Yaw

PERFORMANCE LIMITS	COMMAND	"CHECK" 1	"OUT OF TOLERANCE" 2	"RESET" 3
Airspeed	70K	± 7K	± 15K	± 30K
Altitude	2000'	± 75'	± 150'	± 300°
Heading	90°	± 8°	± 16°	± 32°
Yaw	0°	± 1/2	± 1	-
Torque	20#	-	-	-

Go to Segment 4 (a)

Segment 4(a) - Transition. When instructed, smoothly increase collective/pitch to 24# to start acceleration to 90 KIAS.

Start on Segment 3 END

End on torque pressure 22# or more or 10 sec

No physical reset in transition

No Feedback on Airspeed

Feedback on Altitude, Heading and Yaw

Go to Segment 4(b)

Segment 4(b) - Transition. Use small forward and lateral cyclic to maintain altitude and heading while increasing airspeed to 90 KIAS. Readjust collective pitch to 24# to maintain airspeed to 90 KIAS. Readjust collective pitch to 24# to maintain airspeed if required.

Start on Segment 4(a) end

End on 90 KIAS ±3K or 10 sec

No physical reset in transition

No Feedback on airspeed. Normal Feedback on heading and Altitude and Yaw

Go to Segment 5

Segment 5 - Steady state. Maintain straight and level 090°, 2000' MSL and 90 KIAS for 10 sec.

Start on Segment 4(b) end

End on start (Segment 5) + 10 sec (120 sec)

Use normal feedback in steady state for heading, altitude and airspeed and yaw

Physical reset applies

Go to end of problem

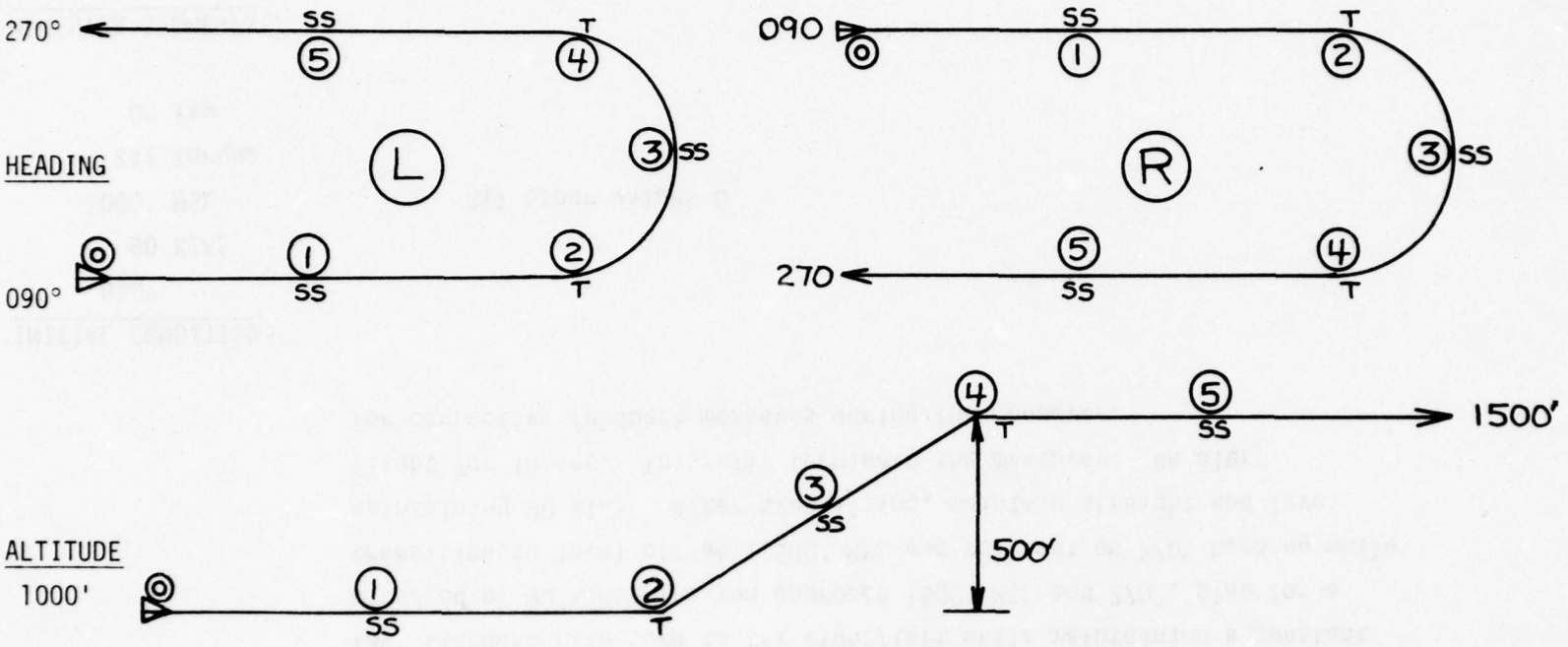
This terminates the maneuver

CUMULATIVE TIME - 1 + 25 Min

Revised 9 Feb 78

MANEUVER PROFILE 6.0

MANEUVER: Climbing Turns



SS - STEADY STATE
T - TRANSITION

MANEUVER DESCRIPTION: (OBJECTIVE)

Starting at an altitude of 1000' MSL 90 KIAS and 090° heading - maintain straight and level flight for 5 sec. When instructed, smoothly start a constant rate 500 fpm climb while simultaneously initiating a 180° standard rate turn to the right/left while maintaining a constant airspeed of 90 KIAS. As you approach 1500' MSL and 270°, plan for a transition to level off at 1,500' MSL and roll out on 270° heading while maintaining 90 KIAS. After stabilizing, maintain straight and level flight for 10 sec. This will terminate the maneuver. Be alert for corrective feedback messages during the maneuver.

INITIAL CONDITION:

090°
90 KIAS
1000' MSL
24# Torque
0° Yaw

All other values 0

MANEUVER SEGMENTS:

Segment 0 - Initial conditions are set. "Continue" button is illuminated.

Start on Initialize

End on "Continue" button depress

Go to Segment 1

MANEUVER PROFILE 6.0

Segment 1 - Steady state. Maintain straight and level for 5 sec. Enable normal feedback and reset conditions.

Start on Segment 0 End

End on play audio message "start L/R climbing turn". (Start Segment 1 + 10 sec.)

Performance Limits	Command	1	2	3
Airspeed	90K	±7K	±15K	±30K
Altitude	1000'	±75'	±150'	±300'
Heading	090°	+8°	+16°	±32°
Yaw	0	-	-	-
Bank Angle	0	-	-	-
Torque	24#	-	-	-

Reset applies in steady state. If reset return to initialize. Normal feedback for 1+2.

Go to Segment 2(a)

Segment 2(a) - Transition. When instructed, smoothly increase collect/pitch to 29# and roll smoothly into a 16° left/right roll to establish a standard rate (30/sec) turn by use of cyclic.

Start on Segment 1 end

End on bank angle 7° or more (right or left) and vertical speed 200' or more or 5 sec.

If turn/climb initiated go to Segment 2(b).

Segment 2(b) - Transition. Establish a 14-17° bank angle (L/R) while establishing a 500 fpm climb. Maintain 90 KIAS in the climbing turn.

Start on Segment 2(a) end

End on Bank angle 14-17° and vertical speed 400 FPM or more or 5 sec.

No physical reset unless bank exceeds 30° either direction. If so reset to initialize.

Go to Segment 3

Segment 3 - Steady state. Maintain a constant rate turn of 3°/sec. and 500 FPM climb. Maintain 90 KIAS airspeed.

Start on Segment 2(b) End.

End on 270°±7° or 1450' or greater.

Performance	Command	1	2	3
Airspeed	90K	±7K	±15K	±30K
Heading	090°↔270°	-	-	-
Altitude	1000'→1500'	-	-	-
Vertical Speed	500 FPM	±100 FPM	±200 FPM	±400 FPM
Collective/Pitch	29#	-	-	-
BANK ANGLE	14-17°	±7°	±15°	L/R±30°
Yaw	0°	±1/2 Ball	±1 Ball	-

Normal feedback on airspeed, V/S, bank and yaw. Peset applies on A/S, and bank (30°) and V/S

Go to Segment 4(a)

Segment 4(a) - Transition. Observe altitude and heading. When approaching 1450' and 270°±7° begin smooth level off and roll out from the climbing turn.

Start on Segment 3 end.

End on bank angle 12° or less and vertical speed 300 fpm or less or 5 sec

Segment 4(a) (Continued)

No physical reset. Normal feedback for A/S.

Go to Segment 4(b)

Segment 4(b) - Transition. Smoothly reduce collective/pitch to 24# and continue roll out and level off to maintain 1500' MSL and 270° heading and 90 KIAS.

Start on Segment 4(a) end

End on torque pressure 24# or 5 sec

No physical reset. Normal feedback for A/S.

Go to Segment 5

Segment 5 - Steady state. Maintain straight and level 270°, 1500', 90 KIAS for 10 sec. Normal feedback enabled.

Start on Segment 4(b) end.

End on start + 10 sec.

Normal feedback for alt, heading, A/S. Physical reset applies.

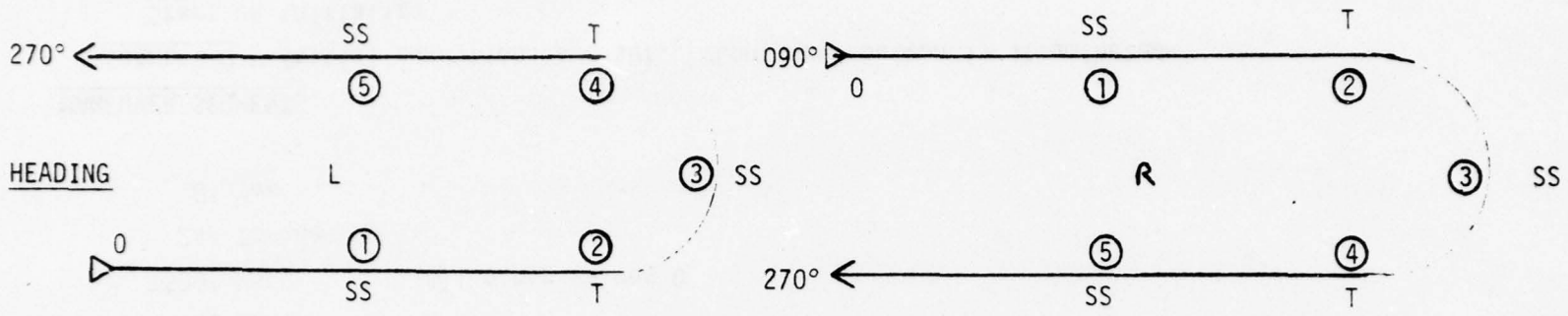
Go to end of problem.

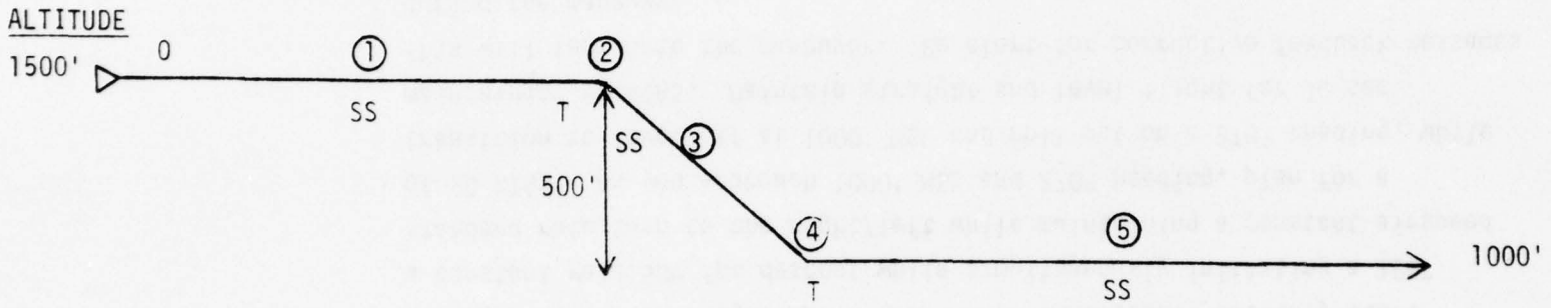
This terminates the maneuver. Cum. time 1 + 30

Revised 9 Feb 78

MANEUVER PROFILE 7.0

MANEUVER: Descending Turns





SS - STEADY STATE
T - TRANSITION

MANEUVER DESCRIPTION: (OBJECTIVE)

Starting at an altitude of 1500' MSL, 90 KIAS and 090° heading - maintain straight and level flight for 5 sec. When instructed, smoothly start a constant rate 500 fpm descent while simultaneously initiating a 180° standard rate turn to the right/left while maintaining a constant airspeed of 90 KIAS. As you approach 1000' MSL and 270° heading, plan for a transition to level off at 1000' MSL and roll out on a 270° heading, while maintaining 90 KIAS. Maintain straight and level flight for 10 sec. This will terminate the maneuver. Be alert for corrective feedback messages during the maneuver.

INITIAL CONDITIONS:

090°
90 KIAS
1500' MSL
24# Torque
0° Yaw

All other values 0

MANEUVER SEGMENTS:

Segment 0 - Initial conditions are set. "Continue" button is illuminated.

Start on initialize

End on "Continue" button depress

Go to Segment 1

Segment 1 - Steady state. Maintain straight and level for 5 sec. Enable normal feedback and reset conditions.

Start on Segment 0 End

End on play audio message "start L/R descending turn".

Performance Limits	Command	1	2	3
Airspeed	90K	±7K	±15K	±30K
Altitude	1500'	±75'	±150'	±300'
Heading	090°	±8°	±16°	±32°
Yaw	0°	-	-	-
Bank Angle	0°	-	-	-
Torque	24#	-	-	-

Reset applies in steady state. If reset, return to initialize normal feedback for 1+2

Go to Segment 2(a)

Segment 2(a) Transition smoothly decrease collective/pitch to 19# and roll smoothly into a (left or right) standard rate turn.

Start on Segment 1 End

Segment 2(a) (Continued)

End on Bank angle 7° or more (right or left) and vertical speed - 200 fpm or more (up to -500 fpm) or 5 sec.

Feedback on airspeed

Segment 2(b) - Transition, establish a 14-17° bank angle (left/right) while establishing a 500 fpm rate of descent. Maintain 90 KIAS in the descending turn.

Start on Segment 2(a) end.

End on bank angle 14-17° and vertical speed -400 fpm or more (up to -500 fpm) or 5 sec.

No physical reset unless roll exceeds 30° (either direction) if so reset to initialize.

Go to Segment 3

Segment 3 - Steady state. Maintain a constant rate turn of 3°/sec and a 500 fpm descent. Maintain 90 KIAS

Start on Segment 2(b) end

Segment 3 (Continued)

End on 270° ± 7° or 1050' or less (1050" - 1000')

Performance	Command	1	2	3
Airspeed	90K	±7K	±15K	±30K
Heading	090→270°	-	-	-
Altitude	1500'→1000'	-	-	-
Vertical Speed	500 fpm	±100 fpm	±200 fpm	±400 fpm
Collective/Pitch	19=	-	-	-
Roll	14°-17°	±7°	±15°	L/R±30°

Normal feedback on airspeed, roll, yaw and vertical speed. Reset applies on airspeed, bank (30°), and V/S

Go to Segment 4(a)

Segment 4(a) - Transition. Observe altitude and heading when approaching 1050' and 270°±7° begin transition to smoothly roll out from the descending turn on 270° and 1000'.

Start on Segment 3 end.

End on bank angle 12° or less and vertical speed - 300 fpm or less or 5 sec.

No physical reset. Normal feedback on airspeed.

Go to Segment 4(b)

Segment 4(b) - Transition. Smoothly increase collective/pitch to 24#. Continue roll out and level off to maintain 1000' MSL, 270° heading and 90 KIAS.

Start on Segment 4(a) end

End on torque pressure 24# or 5 sec.

No physical reset. Normal feedback for A/S.

Go to Segment 5.

Segment 5 - Steady state. Maintain straight and level 270°, 1000' MSL, 90 KIAS for 10 sec.

Start on Segment 4(b) end

End on start + 10 sec

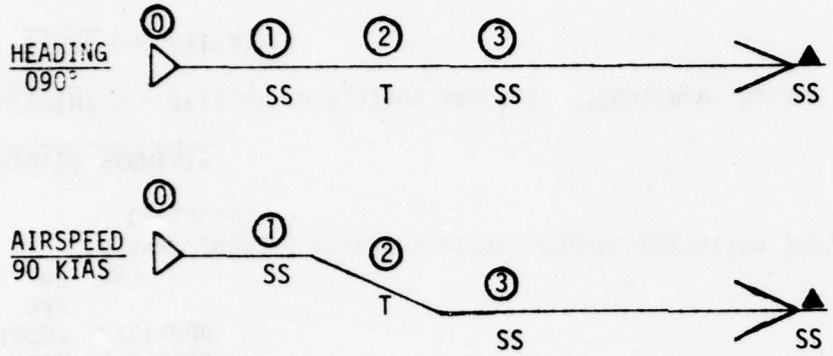
Physical reset applies. Normal feedback for alt, heading, A/S.

Go to end of problem -
This terminates the maneuver: Cum. Time 1 + 30

7 Sept
Revised 23 Sept

MANEUVER PROFILE 8.0

MANEUVER: VOR Tracking



SS - STEADY STATE
T - TRANSITION

MANEUVER DESCRIPTION: (OBJECTIVE)

Starting at an altitude of 1000' MSL, 090°, 90 KIAS - maintain straight and level flight for 10 sec. while stabilized on the VOR radial inbound to the station. When instructed, smoothly reduce collective/pitch to 20#. Decelerate to 70 KIAS while maintaining 1000' MSL and maintaining inbound track. Upon reaching 70 KIAS, maintain airspeed. Maintain 70 KIAS and 1000' for 2 min. This will terminate the maneuver. Be alert for corrective feedback messages during the maneuver.

INITIAL CONDITIONS:

090°	Heading	All other values 0
90K	Airspeed	
1000'	Altitude	
24#		
0°	Yaw	

(Radial Inbound toward station, Course Deviation Indicator (CDI) Localizer Centered)

MANEUVER SEGMENTS:

SEGMENT 0 - Initial conditions are set. "Continue" button is illuminated. VOR on, tuned in.

START on Initialize

END on "Continue" Button depress

GO TO SEGMENT 1

SEGMENT 1 - Steady state. Maintain straight and level for 10 sec. Monitor VOR indications: CDI (localizer centered. Enable normal feedback and reset conditions.

START on Segment 0 END

END on Play Audio Message decelerate (to 70 KIAS and) begin VOR tracking".

PERFORMANCE LIMITS:	Command	1	2	3
Airspeed	90 KIAS	± 7K	± 15K	± 30K
Altitude	1000' MSL	± 75'	± 150'	± 300'
Heading	090°	-	-	-
Yaw	0	-	-	-
Bank Angle	0	-	-	-
Torque	24#	-	-	-
Course Indicator (CDI)	Centered	-	±4°	±8°

Reset applies in steady state. If reset return to initialize. Normal feedback as shown above. Go to segment 2 (a).

SEGMENT 2(a) - Transition. Smoothly decrease collective/pitch when instructed to 20#. Decelerate to 70 KIAS. Maintain 1000' MSL and radial inbound to VOR station.

START on Segment 1 END

END on torque pressure 22= or less or 10 sec.

Go to Segment 2(b)

Revised 9 Feb 78

SEGMENT 2 (b) Transition. Use small aft cyclic to maintain altitude. Track inbound to the on ridial while airspeed decreases to 70 KIAS.

START on segment 2(a) END

END on 70K Ias ± 3K or 10 sec

Go to Segment 3

SEGMENT 3 - Steady state. Maintain straight and level 70 KIAS, 1000' MSL, inbound to station.

START on Segment 2(b) END

END on 2 min

PERFORMANCE LIMITS	COMMAND	1	2	3
Airspeed	70K	±7K	±15K	±30K
Altitude	1000'	±75'	±150'	±300
Heading	-	-	-	-
Yaw	0	-	-	-
Bank Angle	-	-	-	-
Torque	20=	-	-	-
Course Deviation Ind	Centered	-	±4°	±8°

Normal feedback on airspeed + altitude as shown. Reset applies in steady state. This terminates the maneuver Go to END of problem.

SUM Time ≈ 5 min

SEGMENT 4 - Steady State. At station passage track outbound on the 090° radial maintaining 70 KIAS and 1000' MSL. NOTE No. 2 needle on tail.

START on Segment 3 END

END on Segment 4 + 5 sec.

Feedback normal, RESET AS SHOWN in Segment 3. Physical reset applies.

Go to Segment 5

SEGMENT 5 - Steady state. Maintain outbound track on the 090° radial, 70 KIAS, 1000' MSL for 1 minute.

START on Segment 4 END

END on start Segment 5 + 1 min.

Feedback normal, reset as shown in Segment 3 Physical reset applies.

Go to end of problem -
This terminates the maneuver

Cum time can vary - suggest 1 min inbound - 1 minute outbound.

APPENDIX B

PRE-COCKPIT INSTRUCTION PROGRAMMED INSTRUCTIONAL TEXT AND REVIEW TEST

Document sent under separate cover to ARI Research Institute Field Unit, Ft. Rucker, Alabama for use during operational capability demonstration/ acceptance test 23-27 January 1978.

Review Test included herein.

REVIEW TEST

QUESTIONS

1. In a nose low attitude, the helicopter will:

   A. Gain altitude and lose airspeed.

   B. Lose altitude and gain airspeed.

   C. Gain altitude and airspeed.

   D. Lose altitude and airspeed.

2. You are in a nose-low pitch attitude and you want to return to a level pitch attitude. Do you:

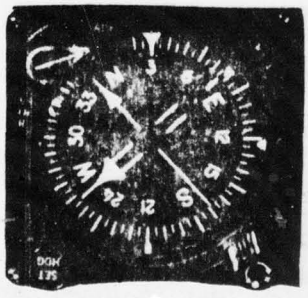
   A. Ease forward on the cyclic.

   B. Pull up on the collective.

   C. Ease back on the cyclic.

   D. None of the above.

3.

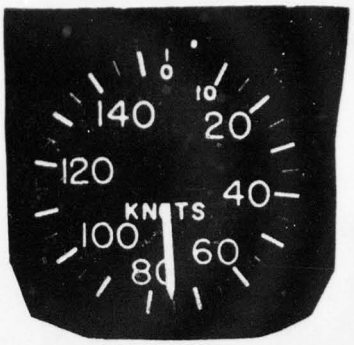


Your instructions are to fly straight and level at a 90 degree heading. Your present heading is displayed on the RMI pictured above. What do you need to do to return to a heading of 90 degrees?

A. Turn right

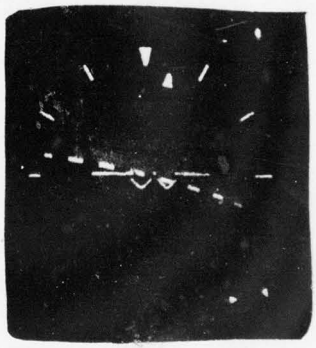
B. Turn left

8.



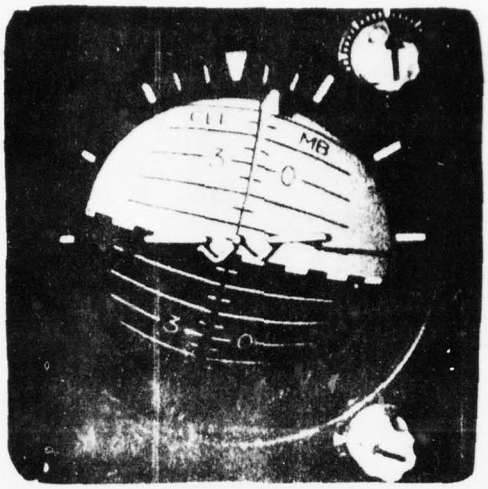
What is the airspeed on the airspeed indicator pictured above?

9.



What is the bank angle shown on the attitude indicator above?

10.



Study the attitude indicator shown above. Which of the following corrective actions will return you to straight and level flight?

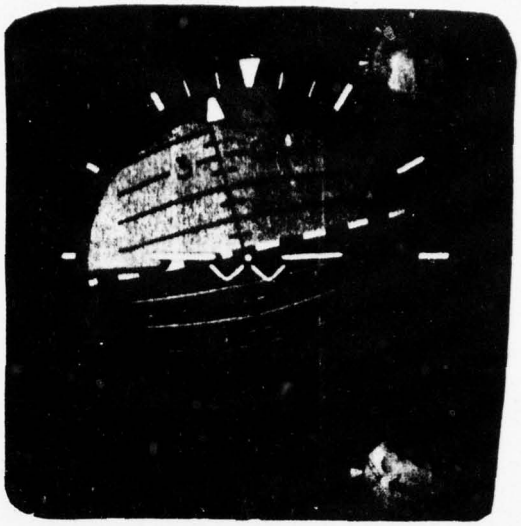
A. Ease the cyclic forward and to the right.

B. Ease the cyclic backward and to the left.

C. Ease the cyclic backward and to the right.

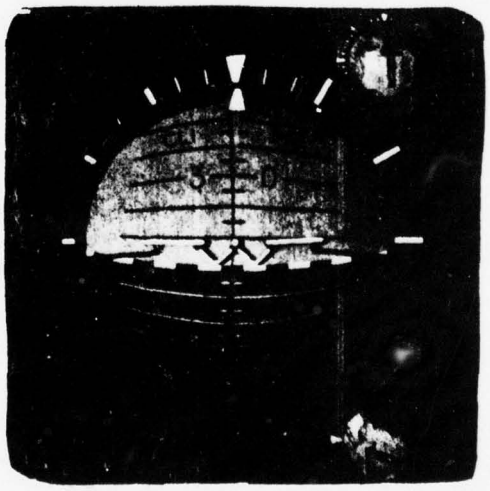
D. Ease the cyclic forward and to the left.

4.



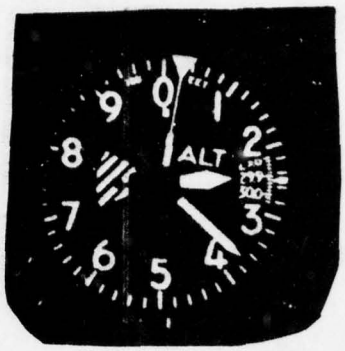
The attitude indicator above shows a turn to the right or to the left? _____

5.



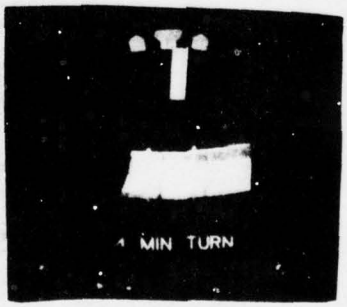
If your attitude indicator displays the pitch attitude shown on the indicator above, do you ease the cyclic forward or backward to return to level flight?

6.



What is the altimeter reading shown on the indicator above?

7.



What action must you take to keep the "ball" centered in the turn and slip indicator shown above.

REVIEW TEST

ANSWERS

1. B.
2. C.
3. Turn to the left 60 degrees.
4. Turn to the right.
5. Ease the cyclic forward.
6. 2,360 feet
7. Push on the left anti-torque pedal.
8. 75 knots.
9. 15 degrees.
10. A.

APPENDIX C

PRE-COCKPIT INSTRUCTION (VOR) PROGRAMMED INSTRUCTIONAL TEXT

Document sent under separate cover to ARI Research Institute Field Unit, Ft. Rucker, Alabama for use during the operational capability demonstration/ acceptance test 23-27 January 1978.

APPENDIX D

INSTRUCTIONAL SCRIPTS

SESSION ONE

PERIOD 1

Msg___ WINDOW

In today's UH-1 Flight Simulator session, you will be learning how to move the controls and fly straight and level.

As you learned in the programmed test, you will use three primary controls to direct flight: the collective, the cyclic, and the anti-torque pedals.

The collective is the control lever located on the left-hand side of your seat. You will use the collective to control power. In helicopter flying, power is called torque. Power or torque is needed to make large altitude and airspeed changes. In today's session, the computer will control the collective for you. However it is good piloting procedure to keep your left hand on the collective at all times.

The cyclic is the control stick located directly in front of you. It is used to make bank and pitch attitude changes. Bank changes are used to control the direction of forward flight as in turns. Pitch changes are used to make small changes in airspeed and altitude.

The cyclic is a very sensitive control and requires little pressure for it to move in any one direction. Thus, you will be told to ease the cyclic from left to right or forward or back.

Place your right forearm on your right thigh and knee. Now hold the cyclic in your right hand, keeping your forearm on your knee and thigh. In this way you can make easy and slow movements with the cyclic using only wrist action. The computer will move the cyclic back and forth
Seg___ and right to left. (TONE)

The computer will release the cyclic to you to practice easing it
Seg___ forward and backward. (TONE)

Seg___ Now, ease the cyclic to the left and to the right. (TONE)

Seg___ Stay clear of all controls and relax. (TONE)

Msg___ WINDOW

Seg___ Push the continue button when the continue light comes on. (TONE)

The last controls you will learn to use are the anti-torque pedals. In flight, you use the pedals to compensate for engine torque and to maintain trim during a turn. When you push the right pedal, the nose of the aircraft will swing to the right. When you push the left pedal, the nose will swing to the left.

Practice using the anti-torque pedals. Place your feet on the pedals.
Seg___ Push slowly on the left pedal. (TONE)

Seg___ Push slowly on the right pedal. (TONE)

Seg___ Stay clear of the controls. (TONE)

Msg___ WINDOW

Seg___ Push the continue button when the continue light comes on. (TONE)

In the following section you will learn how to control the UH-1 Flight Simulator's performance by interpreting the instrument readouts.

Cyclic or stick movements are shown on the attitude indicator. In the UH-1 Flight Simulator the attitude indicator is located in the middle of the top row of instruments directly above the cyclic. It shows the up and down position of the nose and the tilt or bank angle of the helicopter.

The attitude indicator shows a miniature aircraft which represents the UH-1 Flight Simulator and a gray and black sphere which represents the sky and ground. A dashed line separates the sky from the

ground and represents the horizon. Any movement of the cyclic is reflected instantaneously on the attitude indicator.

To demonstrate a nose down position, the computer will move the cyclic forward. Place your right hand on the cyclic and watch the attitude

Seg __ indicator. (TONE)

Seg __ For a nose-up position, the computer will move the cyclic backward. (TONE)

You will now practice moving the cyclic back and forth. While you are moving the cyclic backward and forward, the computer may be moving the cyclic from side to side to maintain level flight.

When the cyclic is released to you, practice easing the cyclic forward to a nose down position and hold the miniature aircraft on the attitude indicator so that it is resting on the first line or little short mark

Seg __ below the horizon line. (TONE)

Practice easing the cyclic backward in a nose up position and hold the miniature aircraft so that it is resting on the little short mark above

Seg __ the horizon line. (TONE)

Practice holding the simulator in straight and level flight so that the

Seg __ miniature aircraft is even with the horizon line. (TONE)

Seg __ Stay clear of the controls. (TONE)

Msg __ WINDOW

Seg __ Push the continue button when the continue light comes on. (TONE)

Immediately to the left of the attitude indicator is the airspeed indicator. Air speed on the airspeed indicator is measured in nautical miles per hour or knots. Zero airspeed is at the top of the scale in the 12 o'clock position. Increasing values are shown in a clockwise position. Beginning at 10 knots, the scale is marked in steps of 5 knots. You will

fly at an airspeed of 90 knots for most of the maneuvers you will be learning to perform.

The cyclic is used to correct small airspeed errors. To increase airspeed, ease the cyclic forward. This causes the nose to drop down and the airspeed to increase. To decrease airspeed ease the cyclic back. This causes the nose to go up and the airspeed to decrease. The computer will demonstrate increasing and decreasing airspeed. Place your right hand on the cyclic grip. Notice how little movement of the cyclic

Seg__ it takes to increase the airspeed by 5 knots. (TONE)

Seg__ Now, the computer will return to 90 knots airspeed. (TONE)

Seg__ Notice how little cyclic is required for a 5 knot decrease. (TONE)

Seg__ The computer will again return you to 90 knots. (TONE)

The computer will release the cyclic to you. You are to practice increasing, decreasing, and maintaining your airspeed. First, practice

Seg__ holding the airspeed at 90 knots. (TONE)

Seg__ Practice decreasing your airspeed to 85 knots. (TONE)

Seg__ Return to 90 knots. (TONE)

Seg__ Stay clear of the controls. (TONE)

Msg__ WINDOW

Seg__ Push the continue button when the continue light comes on. (TONE)

Later you will learn to make large airspeed changes using the collective.

Pause

In the top row of instruments, immediately to the right of the attitude indicator is the altimeter. The altimeter shows altitude. When the needles move clockwise, the altitude is increasing, counterclockwise, the altitude is decreasing.

Remember, the altimeter has three needles but you will read only the long wide needle and the short wide needle. The small thin needle with the inverse triangle on the end of it reads altitude in the tens of thousands of feet and you will not be flying over ten thousand feet.

For the long, wide needle, numbers represent hundreds of feet and the small marks indicate steps of 20 feet each. The reading of the long wide needle is added to the reading of the short wide needle. The short wide needle reads thousands of feet.

The altimeter in the UH-1 Flight Simulator is currently reading 2000 feet. Practice reading the following altimeter settings. (TONE)

Seg___ What does the altimeter read now?

If you answered 2150 feet, you were correct. The short wide needle reads 2 thousand feet and the long wide needle reads 150 feet. (TONE)

Seg___ What does the altimeter read now?

1950 is the correct answer. (PAUSE)

Large altitude changes of more than 75 feet are made with the collective. However, to make small altitude changes of 50 to 75 feet or less you will use the cyclic. If you ease the cyclic forward the nose will go down and you will lose altitude. If you ease the cyclic backward, the nose will go up and you will gain altitude.

When the cyclic is released to you practice increasing altitude by fifty feet,returning to 2000 feet,and decreasing altitude by 50 feet. The computer will move the cyclic from side to side to maintain level

Seg___ flight. (TONE)

Seg___ Stay clear of all controls. (TONE)

Msg___ WINDOW

Seg___ Push the continue button when the continue light comes on. (TONE)

The next set of instruments is directly related to the roll or banking attitude of a helicopter. First, the attitude indicator.

The attitude indicator is a primary indicator of roll or bank attitude as well as of pitch attitude.

When a helicopter turns, the helicopter tilts or banks to the left or to the right. On the attitude indicator the miniature aircraft's wings also tilt or bank to the left or to the right in a turn. Think of the wings of the miniature aircraft as representative of your helicopter.

In a right roll, the right wing of the miniature aircraft goes down below the horizon line. Watch what happens on the attitude indicator Seg___ when the computer banks or rolls to the right. (TONE)

In a left bank or roll, the left wing of the miniature aircraft goes down below the horizon line. Watch what happens on the attitude indicator Seg___ when the computer banks or rolls to the left. (TONE)

Straight and level flight, that is, no turn to the right or left, and no climb or descent, is indicated on the attitude indicator by the wings of the miniature aircraft overlapping the horizon line.

The attitude indicator also indicates the degree of bank. The angle of bank scale is located at the top of the indicator. The center mark represents zero bank, and each of the large marks to the left and to the right of the zero mark represent 30° of bank. Intermediate marks represent 10° of bank. Remember, the angle of bank indicator moves in the opposite direction from that in which the helicopter is actually banked.

You will move the cyclic to the left to bank to the left and to the right to bank to the right. As with pitch control movements, use very little pressure to control bank or roll.

The computer will release the cyclic to you; however, the computer will move the cyclic back and forth to maintain airspeed and attitude while you are practicing turns to the right and left.

Seg___ First, practice banking to the right using a 10° bank angle. (TONE)

Seg___ Return to level flight. (TONE)

Seg___ Practice banking to the left using a 15° bank. (TONE)

Seg___ Return to level flight. (TONE)

Seg___ Stay clear of all controls. (TONE)

Msg___ WINDOW

Seg___ Push the continue button when the continue light comes on. (TONE)

The turn and slip indicator also gives you information regarding the rate and quality of a turn. The turn and slip indicator is located in the bottom row of instruments under the airspeed indicator. The turn indicator consists of a moving pointer and three fixed marks. The center mark shows a no turn condition while the outer marks show a turn rate of 3° per second. The pointer moves in the direction of the turn.

The slip indicator at the bottom of the instrument displays the quality or trim of the turn. The aircraft is trimmed properly when the ball is centered between the two white lines on the tube. If the ball moves to the left of center, apply left pedal and to the right, apply right pedal.

Heading is displayed by the radio magnetic indicator (or RMI) which is located directly under the attitude indicator. As the helicopter turns, the magnetic heading of the helicopter will be displayed under the index at the top of the instrument. Read the numbers on the compass card as if they were multiplied by ten. If you are holding a set heading and you begin to drift to the right of that heading you will have to make a turn to the left to get back on course. If you drift to the left of your desired heading, you will have to turn right to get back on course.

To help you learn to fly the UH-1 Flight Simulator, two feedback systems are provided. First, you will receive auditory messages via the voice synthesizer telling you when to check performance, when you are in an out of tolerance condition and when you have exceeded the limits for a particular flight parameter.

Visual feedback will be given to you on the CRT screen over your left shoulder at the end of the maneuver. On it, you will see a history of your performance controlling airspeed and altitude.

_____ Pause _____

Now you are ready to learn a few simple maneuvers, beginning with straight and level flight.

Straight and level flight is flight in which a constant attitude, altitude, and airspeed are maintained. Level flight is attained by using your flight instruments as reference points for controlling the helicopter's performance and attitude. For example, you will be told to fly straight and level at an altitude of 2000 feet, an airspeed of 90 knots and a heading of 90°.

In straight and level flight, correct small altitude and airspeed errors by making small pitch changes with the cyclic. Keep in mind, though, that airspeed and altitude are very closely related. If your airspeed increases, you will begin to descend or lose altitude. If airspeed decreases, you will begin to climb or gain altitude. Thus, everytime you move the cyclic forward or backward to correct airspeed, altitude will be effected. You can minimize this effect by making very slight, slow control movements.

If the airspeed is greater than 90 knots, ease the cyclic back so that the miniature aircraft on the attitude indicator is resting slightly above the horizon line - never more than above the first line or bar. When you reach 90 knots, ease the cyclic forward to a nose level attitude.

If the airspeed is less than 90 knots, ease the cyclic slowly forward so that the miniature aircraft on the attitude indicator is resting slightly below the horizon line - again, never more than one line or bar below the horizon line.

Altitude corrections are similar to airspeed corrections. For example, if the altitude is greater than 2000 feet, ease the cyclic forward so that the miniature aircraft is no lower than one bar or line below the horizon. You will notice at the same time that the airspeed is increasing. Do not let it increase by more than five knots. When you are within 20 feet of the desired altitude, ease the cyclic back to a nose level attitude.

If the altitude is less than 2000 feet, ease the cyclic back to a slight nose high position. However, do not let the airspeed decrease by more than five knots. When you are within 20 feet of the desired altitude, ease the cyclic forward to a nose level attitude.

Remember, the key to successful flying is slow, small movements of the controls. Any sudden large, fast, or hard movements of the cyclic will result in a situation that will be very difficult to correct.

To correct for a heading error to the right ease the cyclic to the left. Ease the cyclic to the right for a heading error to the left.

You will also want to keep the ball centered in the turn and slip indicator. If the ball moves to the left, apply left pedal and if the ball moves to the right, apply right pedal. Keep your feet on the antitorque pedals at all times. Apply equal pressure to both pedals except when necessary to maintain trim. Unequal pressure will cause you to move to the right or left of your heading.

You will now practice flying straight and level at an altitude of 2000 feet, a heading of 90° and an airspeed of 90 knots for three minutes.

If you should reach an out of control condition, the computer will stop the flight simulator and reset you to the initial conditions.

At the end of the first three minute time period, the computer will stop the UH-1 Flight Simulator and reset it for the second practice session. Check the CRT screen behind you for your performance history.

Stay clear of the controls while the computer sets the condition for
Seg___ your first straight and level practice session. (TONE)

Msg___ WINDOW

Seg __ Push the continue button and take control of the simulator. (TONE)

Seg __ End of practice session. Stay clear of the controls. (TONE)

Msg___ WINDOW

Push the continue button and take control of the simulator for the
Seg___ second practice session. (TONE)

Seg___ End of practice. Stay clear of the controls. (TONE)

Msg___ WINDOW

Seg___ Push the continue button. (TONE)

The next maneuver involves flying straight and level in rough air conditions. Rough air conditions are created by turbulence outside of the helicopter. Your helicopter is an unstable platform in the best of conditions and in rough air this instability is increased. The rough air will cause your helicopter to pitch and roll in an unexpected manner. Thus, you will have to monitor your instruments and controls very closely and correct any additional errors produced by the rough air condition. Use your attitude indicator as your primary control instrument and cross-check with your altimeter, RMI, and airspeed indicator. Make smooth easy control corrections.

Practice flying straight and level in rough air, at an altitude of 2000 feet, a heading of 90° and an airspeed of 90 knots for three minutes.

If you should reach an out of control condition, the computer will reset you to the initial conditions.

You will be given enough time to have two practice sessions of flying straight and level in rough air.

Stay clear of the controls while the computer sets the conditions for
Seg___ your first straight and level with rough air practice sessions. (TONE)

Msg___ WINDOW

Seg___ Push the continue button and take control of the simulator. (TONE)

Seg Stay clear of the controls. (TONE)

Msg WINDOW

Push the continue button and take control of the simulator for the second practice session. (TONE)

Seg___

End of practice. Stay clear of the controls. (TONE)

Seg___

Msg___ WINDOW

Push the continue button. (TONE)

Seg___

During some of the flight maneuvers you will be asked to do an additional communications task using the UHF radio set. The UHF radio set is located on the left hand side of the pedestal, two panels above the UH-1 Flight Simulator training control panel. The letters UHF are printed on the left hand side of the radio. You will be primarily concerned with the function select switch, the mode selector, the preset channel control and the preset channel indicator.

The function select switch is the control knob on the right hand side of the UHF radio set. Make sure it is pointing to the T/R&G position which is the second position under OFF. (PAUSE 7 seconds.)

The mode selector is the control knob that is located on the left hand side of the radio set next to the letters UHF. The mode selector should be pointing to the preset channel position which is the top position on the dial. (PAUSE 7 seconds.)

The preset channel control knob is above the mode selector and slightly to the right. You will use this control knob to dial in a designated channel.

The preset channel indicator is directly above the preset channel control. It displays the number of the channel that you have selected.

The communications task consists of checking in on a designated channel whenever you hear your call sign. Your call sign is Army-One-Seven. During a maneuver you may occassionally hear call signs with requests for information. Some of these call signs will be yours, some similar to yours so you will have to listen carefully. Whenever you hear your call sign, you are to dial in the indicated channel, key your microphone, two deflections and respond with your call sign.

For example; you may hear "Army-One-Seven Communications Check on channel three." You will then turn to channel three on the UHF radio, key your microphone and respond with "Army-One-Seven Communications Check."

You should respond as quickly as possible. However, your primary task is to fly each maneuver as accurately and as smoothly as possible. If you do not respond to your call sign within a given period time, the message will be repeated.

Practice flying straight and level while listening for your call sign of Army-One-Seven. When you hear your call sign turn to the correct channel, key the mike and report in.

Seg___ BEGIN (TONE)

Seg___ Stay clear of controls. (TONE)

Msg__ WINDOW

Testing for today will consist of:

Eight minutes of straight and level flight. During this period you may experience rough air at times; you will also be required to perform the communications task whenever you hear your call sign.

You will be flying straight and level at 2000 feet altitude, 90° heading and 90 knots airspeed.

Seg___ Now, take control of the simulator. (TONE)

Seg___ End of testing. (TONE)

SESSION TWO

PERIOD 2

Msg___ WINDOW/TONE

Seg___

Before you begin today's instruction on level turns and climbs, you will be tested on straight and level flight. However, let's review the communications task before the straight and level test.

The communications task consists of checking in on a designated channel on your UHF radio, whenever you hear your call sign of ARMY-One-Seven. During a maneuver you may occasionally hear call signs with requests for information. Some of these call signs will be yours, and some similar to yours, so you will have to listen carefully. Whenever you hear your call sign, you are to dial in the indicated channel on the UHF radio, key your microphone two deflections and respond with your call sign.

You should respond as quickly as possible. However, your primary task is to fly each maneuver as accurately and as smoothly as possible. If you do not respond to your call sign within a given period of time the message will be repeated.

You will be flying straight and level at an altitude of 2000 ft., a heading of 90° and an airspeed of 90 knots for three minutes. You may experience rough air at any time. You will also be required to perform the communications task.

Seg___ Stay clear of the controls while the initial conditions are set. (TONE)

Msg___ WINDOW

Seg___ Push the continue button and take control of the simulator. (TONE)

Seg___ Stay clear of the controls and relax. (TONE)

Msg___ WINDOW

Seq___ Push the continue button. (TONE)

Since you will be learning to make level turns in today's instructions, let's review the attitude indicator for roll attitude only.

Straight and level flight is indicated on the attitude indicator when
Seq___ the wings of the miniature aircraft are even with the horizon line. (TONE)

In a right bank or roll, the right wing of the miniature aircraft goes
Seq___ down below the horizon line. (TONE)

In a left bank or roll, the left wing of the miniature aircraft goes
Seq___ down below the horizon line. (TONE)

The first maneuver you will learn today is a level turn to the left and a level turn to the right. First, you will learn how to make a level turn of 180° to the left.

As you listen to the instruction the computer will make a level turn to the left beginning at 90°. The altitude will be 2000 feet and the airspeed, 90 knots. Observe the instruments, paying particular attention to the attitude indicator and the turn and slip indicator as the maneuver
Seq___ progresses. (TONE)

You begin a level turn to the left by easing the cyclic to the left until you have reached a bank angle of approximately 16°. When you have reached a bank angle of 16°, relax your pressure on the cyclic to avoid overbanking. At the same time, you must maintain a level pitch attitude, an altitude of 2000 feet, and an airspeed of 90 knots.

Make minor bank adjustments to maintain your turn rate. A 16° bank angle level turn at 90 knots is a standard rate turn. On the turn and slip indicator, the pointer on the turn needle should be on the mark or "Doghouse" to the left of the zero bank position.

Be sure to include the ball in the turn and slip indicator in your in-

strument crosscheck. Only if the ball moves to the left or to the right do you need to make the proper pedal corrections. Do not use the pedals to assist the turn.

When you are approximately eight degrees from the desired heading, begin
Seg___ your rollout from the turn. (TONE)

Ease the cyclic to the right to a wings level attitude on the attitude indicator.

Maintain a level attitude, an altitude of 2000 feet, and an airspeed of 90 knots.

Upon completion of the turn, you should be at your desired heading of 270°, an altitude of 2000 feet and an airspeed of 90 knots.

Practice a 180° level turn to the left, beginning at a heading of 90°, an altitude of 2000 feet, and an airspeed of 90 knots.

When the controls are released to you for the practice session you will be given enough time to get your aircraft under control before beginning the turn. You will receive a verbal signal to start the turn.

If you should reach an out of control condition the computer will reset you to the initial conditions.

You will practice turning 180° to the left two times.

Stay clear of the controls while the computer sets the conditions for a
Seg___ 180° level turn to the left. (TONE)

Msg___ WINDOW

Seg___ Push the continue button and take control of the simulator. (TONE)

Seg___ Begin left turn. (TONE)

Seg___ End of practice. Stay clear of the controls. (TONE)

Msg___ WINDOW

Seg___ Push the continue button and take control of the simulator for the second practice. (TONE)

Seg___ Begin left turn. (TONE)

Seg___ End of practice. Stay clear of the controls. (TONE)

Msg___ WINDOW

Seg___ Push the continue button. (TONE)

Seg___ Now you will learn how to make a level turn to the right. The computer will again accompany the audio instruction and fly a level turn to the right beginning at 90°. The altitude will be 2000 feet and the airspeed, 90 knots. Observe the instruments, particularly the attitude indicator and the turn and slip indicator, as the maneuver progresses. (TONE)

You begin a level turn to the right by easing the cyclic to the right until you have reached a bank angle of 16°. When you have reached a bank angle of 16°, relax the sideward pressure on the cyclic to avoid overbanking. At the same time you must maintain a level pitch attitude, an altitude of 2000 feet and an airspeed of 90 knots.

Make minor bank adjustments to maintain your turn rate. Remember, a 16° bank angle turn at 90 knots is a standard rate turn so check your turn and slip indicator to maintain your turn rate.

Be sure to include the ball in the turn and slip indicator in your instrument crosscheck. Only if the ball moves to the left or to the right do you need to make the proper pedal corrections.

When you are approximately eight degrees from the desired heading, begin
Seg___ rollout from the turn. (TONE)

Ease the cyclic to the left to a wings level attitude on the attitude indicator.

Maintain a level attitude, an altitude of 2000 feet, and an airspeed of 90 knots.

Upon completion of the turn you should be at your desired heading of 270°, an altitude of 2000 feet, and an airspeed of 90 knots.

Practice a 180° level turn to the right, beginning at a heading of 90°, an altitude of 2000 feet, and an airspeed of 90 knots.

When the controls are released to you for the practice session you will be given enough time to get your aircraft under control before beginning the turn. You will receive a verbal signal to mark the beginning of the turn.

If you should reach an out of control condition, the computer will reset you to the initial conditions.

You will practice turning 180° to the right two times.

Stay clear of the controls while the computer sets the condition for a
Seg___ 180° level turn to the right. (TONE)

Msg___ WINDOW

Seg___ Push the continue button and take control of the simulator. (TONE)

Seg___ Begin right turn. (TONE)

Seg___ End of practice. Stay clear of the controls. (TONE)

Msg___ WINDOW

Push the continue button and take control of the simulator for the second practice. (TONE)

Seg___ Begin right turn. (TONE)

Seg___ End of practice. Stay clear of the controls. (TONE)

Msg___ WINDOW

Seg___ Push the continue button. (TONE)

The next maneuver you will learn today is a normal climb. Climbs involve the use of the collective.

The collective is the control used to make large attitude and airspeed changes. If you pull up on the collective you will increase the amount of power available to you. With the increase in power and a constant pitch attitude you will begin to climb. If you push down on the collective and maintain a constant pitch attitude you will decrease power and lose altitude.

The computer will release the collective to you. Note how an increase or a decrease in power effects the instruments. First, practice pulling

Seg___ the collective up slowly and gradually. (TONE)

Seg___ Now push the collective down slowly and gradually. (TONE)

Seg___ Stay clear of the controls. (TONE)

Msg___ WINDOW

Seg___ Push the continue button. (TONE)

Movement of the collective is related to the instrument readings of the torquemeter. The torquemeter is in the left hand column of instruments directly in front of you and it is the second from the top. The torquemeter indicates the amount of torque pressure in pounds per square inch imposed upon the transmission. As you increase power, torque pres-

sure increases and as you decrease power, the torque pressure decreases. More power is needed for climbs, less power for descents.

On the torquemeter, pressure is measured from 0 to 100 lbs. per square inch. The scale is numbered in steps of 20 lbs. The large marks between the numbers represent ten lbs. of pressure and the small marks represent five lbs.

The torquemeter presently reads 24 lbs. You will use 24 lbs. of pressure for most constant altitude and level flight maneuvers. You will change the torque pressure setting by moving the collective up or down.

The collective will now be released to you to practice changing the power setting. First, ease up on the collective to a setting of 29 lbs.

Seg___ of torque pressure. (TONE)

You will use a torque setting of 29 lbs. to make a climb of 500 feet per minute. Push down slowly and gradually on the collective to a setting

Seg___ 19 lbs. (TONE)

You will use a torque setting of 19 lbs. to make descents of 500 feet

Seg ___ per minute. Return the collective to a torque setting of 24 lbs. (TONE)

Seg___ Stay clear of the controls. (TONE)

Msg___ WINDOW

Seg___ Push the continue button. (TONE)

Another new instrument that you will be using today is the vertical speed indicator. The vertical speed indicator is directly under the altimeter. The vertical speed indicator shows how fast the UH-1 Flight Simulator is climbing or descending in feet per minute. On the vertical speed indicator, level flight is shown on the left edge of the scale by the number zero. Scale marks below zero show the descent rate of the helicopter. Those above zero show the aircraft's climb rate. The small marks above and

below zero represent 100 feet per minute. The numbers .5, one, two, and three represent 500, 1000, 2000, and 3000 feet per minute. You will climb or descend at a rate of 500 feet per minute.

The vertical speed indicator readings are related to movements of both the collective and the cyclic. The cyclic is used to make small corrections of less than 150 feet per minute in the vertical speed rate. The collective is used to make large corrections of 150 feet per minute or more in vertical speed. A good rule to follow when making changes in altitude, is: 1 lb of torque pressure will change the rate of climb or descent 100 feet per minute. Decrease your torque setting by five lbs for a 500 feet per minute descent, increase five lbs for a 500 feet per minute climb.

Another important fact to remember about the vertical speed indicator is that there is a short time lag between control movement and instrument reading. Whenever you use the collective to climb or descend wait 5 to 6 seconds before checking the vertical speed indicator and making any further control changes.

When the collective is released to you, you will practice climbing at 500 feet per minute and descending at 500 feet per minute. Be sure to use the rule - decrease torque one lb. for every 100 feet rate of climb or descent.

Seg ___ First using only the collective, climb at a rate of 500 feet per minute. (TONE)

Seg___ Return to straight and level. (TONE)

Seg___ Now, descend at a rate of 500 feet per minute. (TONE)

Seg___ Return to straight and level. (TONE)

Seg___ Stay clear of the controls. (TONE)

Msg___ WINDOW

Seg___ Push the continue button. (TONE)

You are now ready to learn how to make a normal climb. The computer will demonstrate a normal climb as you listen to the instruction. Place your right hand on the cyclic, your left on the collective, and your feet

Seg __ on the antitorque pedals. (TONE)

You will climb 1000 feet at a rate of 500 feet per minute by increasing torque five additional pounds of pressure, one pound for every 100 feet of climb rate. So first, ease up on the collective until the torquemeter reads 29 lbs., and simultaneously, ease forward slightly on the cyclic to maintain an airspeed of 90 knots and a level attitude. Push on the left pedal to counteract torque and keep the ball centered in the turn and slip indicator.

Hold your heading of 90° by using the cyclic to maintain a level bank attitude.

Maintain a climb rate of 500 feet per minute. Remember, it takes five to six seconds delay before the vertical speed indicator shows any control changes. Use the cyclic to make small, minor changes in vertical speed. Large corrections of 150 feet or more should be made with the collective.

Maintain a level attitude, 90 knots airspeed and a 90° heading throughout the climb. Keep the ball centered.

When you are about 40 to 60 feet below 2000 feet altitude, begin to

Seg___ level off. (TONE)

First, lower the collective to a torque setting of 24 lbs. and, at the same time, ease back slightly on the cyclic to maintain an airspeed of 90 knots.

Hold your heading of 90°.

Use the pedals to keep the ball centered.

When you have reached 2000 feet, fly straight and level at 2000 feet altitude, an airspeed of 90 knots, and a heading of 90° for ten seconds.

Now you are ready to practice climbing from the 1000 feet to 2000 feet altitude, and an airspeed of 90 knots, and a heading of 90°.

When the controls are released to you, you will have enough time to get your helicopter under control before beginning the climb. You will be given a verbal signal to mark the beginning of the climb.

You will have two practice sessions of climbing 1000 feet.

If you should reach an out of control condition during the practice, the computer will take over and reset you to the beginning of the climb.

Stay clear of the controls while the computer sets the conditions for
Seg___ the first practice climb. (TONE)

Msg___ WINDOW

Seg___ Push the continue button and take control of the simulator. (TONE)

Seg___ Begin climb. (TONE)

Seg___ End of practice. Stay clear of the controls. (TONE)

Msg___ WINDOW

Push the continue button and take control of the simulator for the
Seg___ second practice. (TONE)

Seg___ Begin climb. (TONE)

Seg___ End of practice. Stay clear of the controls. (TONE)

Msg___ WINDOW

Seg___ Push the continue button. (TONE)

Notify the console operator that you are ready for Session Two's Testing.

PERIOD 3

Msg___ WINDOW

Testing for today will consist of: 1st, a normal climb; 2nd, straight and level flight; 3rd, a 180° level turn to the right; 4th, straight and level flight; 5th, a 180° level turn to the left; and 6th, straight and level. You may experience rough air at any time. You will also be required to perform the communications task. You will receive a verbal signal to mark the beginning of each maneuver.

Seg___ Push the continue button and take control of the simulator. (TONE)

Seg___ Begin climb. (TONE)

Seg___ Begin right turn. (TONE)

Seg___ Begin left turn. (TONE)

Seg___ End of first testing session. Stay clear of the controls. (TONE)

Msg___ WINDOW

Seg___ Push the continue button. (TONE)

Testing will consist of: first, you will make a climb of 1000 feet; second, fly straight and level; third, turn right 180°; fourth, fly straight and level; fifth, turn left 180°; sixth, fly straight and level. Again, you will be told when to begin each maneuver. You may experience rough air at any time and you will be required to perform the communications task.

Stay clear of the controls while the computer resets the flight
Seg ___ simulator. (TONE)

Msg___ WINDOW

Seg___ Push the continue button. (TONE)

Seg___ Begin climb. (TONE)

Seg___ Begin right turn. (TONE)

Seg Begin left turn. (TONE)

Seg___ End of testing session. (TONE)

NOTE: Second 8 min Test period used to initiate Session 3.

SESSION THREE

PERIOD 4

Msg___ WINDOW

Seg___ TONE

In todays session, you will review level turns and normal climbs, and you will learn how to make descents and execute decelerations.

During the level turn review, the computer will fly a 180° level turn to the right, beginning a 90° heading, 2000 feet altitude, and 90 knots airspeed. Place your right hand on the cyclic and your feet on the

Seg___ anti-torque pedals. (TONE)

You begin a level turn to the right by easing the cyclic to the right until you have reached a bank angle of 16°.

Maintain a level pitch attitude, 2000 feet altitude, and an airspeed of 90 knots.

NOTE: Review Option

Remember, a 16° bank angle turn at 90 knots is a standard rate turn, so check your turn and slip indicator to maintain your turn rate.

otherwise start with Second 8 min Test on Day 2 then go to page 4

Keep the ball centered in the turn and slip indicator.

Approximately eight degrees from the desired heading of 270°, begin your rollout from the turn. First, ease the cyclic to the left to a wings level attitude on the attitude indicator.

Maintain a level attitude, an altitude of 2000 feet and an airspeed of 90 knots.

Upon completion of the turn, you should be at the desired heading of

Seg___ 270°, at an altitude of 2000 feet, and an airspeed of 90 knots. (TONE)

Practice a 180° level turn to the right, beginning at a heading of 90° an altitude of 2000 feet, and an airspeed of 90 knots. When the controls are released to you, you will be given enough time to get your helicopter under control before beginning the turn. You will receive a verbal signal to indicate when to begin the turn.

If you should reach an out of control condition, the computer will reset you to the initial conditions.

Stay clear of the controls while the computer sets the conditions for
eg___ a 180° level turn to the right. (TONE)

Msg___ WINDOW

eg __ Push the continue button and take control of the simulator. (TONE)

eg __ Begin right turn. (TONE)

eg___ End of practice. Stay clear of the controls. (TONE)

Msg___ WINDOW

Seg___ Push the continue button. (TONE)

Now, for the normal climb review. The computer will demonstrate a normal climb of 1000 feet beginning at 1000 feet altitude and climbing at a rate of 500 feet per minute as you listen to the instruction. Place your left hand on the collective, your right hand on the cyclic
eg and your feet on the antitorque pedals. (TONE)

First, ease up on the collective until the torquemeter reads 29 lbs. and simultaneously ease forward slightly on the cyclic to maintain an airspeed of 90 knots and a level attitude, push on the left pedal to counteract torque and keep the ball centered in the turn and slip indicator.

Hold your heading of 90° by using the cyclic.

Maintain a climb rate of 500 feet per minute. Use the cyclic to make small minor changes in the vertical speed. Large corrections of 150 feet or more should be made with the collective.

Maintain a level attitude, 90 knots airspeed and a 90° heading throughout the climb. Keep the ball centered.

When you are about 40 to 60 feet below 2000 feet altitude, begin to level-off.

First, lower the collective to a torque setting of 24 lbs. and at the same time ease back slightly on the cyclic to maintain an airspeed of 90 knots.

Hold your heading of 90°. Use the pedals to keep the ball centered.

When you have reached 2000 feet altitude, fly straight and level at
Seg___ 2000 feet, 90 knots airspeed, and a 90° heading for ten seconds. (TONE)

Practice climbing from 1000 to 2000 feet altitude at a rate of 500 feet per minute while maintaining an airspeed of 90 knots, and a heading of 90°. When the controls are released to you, you will have enough time to get the helicopter under control before beginning the climb. You will receive a verbal signal to tell you when to begin the climb.

If you should reach an out of control condition during the practice, the computer will take over and reset you to the beginning of the climb.

Stay clear of the controls while the computer sets the conditions for
Seg___ the practice climb. (TONE)

Msg___ WINDOW

Seg___ Push the continue button and take control of the simulator. (TONE)

Seg___ Begin climb. (TONE)

Seg___ End of Practice. Stay clear of the controls. (TONE)

E: start
e after
econd 8 min
t from
2

Msg___ WINDOW

Seg___ Push the continue button. (TONE)

The new maneuvers you will learn today are a normal descent and a deceleration-acceleration.

The normal straight descent is the reverse of the normal climb. The primary control in making descents is the collective. The cyclic and antitorque pedals are support controls used to maintain attitude and trim.

The computer will demonstrate a 1000 feet descent from 2000 feet at a rate of 500 feet per minute as the steps of making a descent are described.

Since you will be descending at a rate of 500 feet per minute, you will need to decrease power by 5 lbs. - one pound for every one

Seg___ hundred feet of descent rate. (TONE)

First, you will lower the collective to a setting of 19 lbs. on the torquemeter, and simultaneously, ease back slightly on the cyclic to maintain an airspeed of 90 knots and a level attitude.

Push on the right rudder pedal to counteract decreased torque and keep the ball centered in the turn and slip indicator.

Hold the 90° heading by using the cyclic.

Maintain a descent rate of 500 feet per minute. The cyclic may be used to make small minor changes in vertical speed. Large corrections of 150 feet or more should be made with the collective.

Maintain a level attitude, 90 knots airspeed, and a 90° heading throughout the descent. Keep the ball centered.

When you are about 40 to 60 feet above the desired altitude of 1000 feet, begin to level off.

Raise the collective to a torque setting of 24 lbs., and at the same time, ease forward slightly on the cyclic to maintain an airspeed of 90 knots and a level attitude.

Hold your heading of 90°.

Use the pedals to keep the ball centered.

When you have reached 1000 feet, fly straight and level at 1000 feet altitude, an airspeed of 90 knots and a heading of 90° for ten

Seg___ seconds. (TONE)

Now you are ready to practice descending from 2000 feet to 1000 feet altitude at a rate of 500 feet per minute, while maintaining an airspeed of 90 knots, and a heading of 90°.

When the controls are released to you, you will have enough time to get your helicopter under control before beginning the descent. A verbal signal will tell you when to begin to descend.

You will have two practice sessions of descending 1000 feet.

If you should reach an out of control condition the computer will reset you to the beginning of the descent.

Stay clear of the controls while the computer sets the conditions for

Seg___ the first practice descent. (TONE)

Msg___ WINDOW

Seg___ Push the continue button and take control of the simulator. (TONE)

Seg___ Begin descent. (TONE)

Seg___ End of first practice. Stay clear of the controls. (TONE)

Msg___ WINDOW

Seg___ Push the continue button and take control of the simulator for the second practice. (TONE)

Seg___ Begin descent. (TONE)

Seg End of practice. Stay clear of the controls. (TONE)

Msg___ WINDOW

Seg___ Push the continue button. (TONE)

The second maneuver you will learn how to do today is a deceleration maneuver. The object of a deceleration maneuver is to reduce airspeed while maintaining altitude and heading. It is a precision maneuver requiring careful control movements and coordination skills. You will be required to drop your airspeed from 90 knots to 70 knots while maintaining an altitude of 2000 feet and a heading of 90°. You will then recover to a 90 knot airspeed.

To decrease airspeed by 20 knots, you will need to lower the collective. The general rule is that one pound of torque will change airspeed five knots. At the end of the deceleration, then, your torque setting should be 20 pounds for a 20 knot decrease. However, to maintain altitude it is easier to slowly lower the collective and ease back on the cyclic until you have reached 70 knots airspeed and then fine tune the collective until you have reached 20 lbs. torque and zero vertical speed. The computer will fly this maneuver as the

Seg___ steps are described. (TONE)

First, slowly lower the collective to begin the decrease in airspeed. At the same time ease the cyclic back to a slight nose high attitude to prevent a loss in altitude. Apply slight right pedal pressure to keep the ball centered in the turn and slip indicator. Maintain a heading of 90 degrees.

If you should start to lose altitude, slow down on the collective and ease back a little on the cyclic. If you should begin to gain altitude, lower the collective a little faster and apply less aft cyclic.

Continue lowering the collective until you have reached an airspeed of 70 knots. At 70 knots, check your torquemeter. If it does not read 20 pounds, adjust your collective until it does. To fly at an airspeed of 70 knots and an altitude of 2000 feet, you will be in a slight nose high attitude. To help you determine how much aft cyclic to apply, keep the vertical speed indicator at zero vertical speed.

Maintain 70 knots airspeed, an altitude of 2000 feet and a heading of
Seg___ 90 degrees. (TONE)

To begin the recovery to 90 knots airspeed, raise the collective slowly. At the same time, ease forward on the cyclic to maintain altitude and prevent climbing. Your attitude indicator should show a slight nose low attitude. Apply left pedal to keep the ball centered in the turn and slip indicator. Maintain a heading of 90° with the cyclic.

Continue raising the collective until you have reached an airspeed of 90 knots. Maintain an altitude of 2000 feet.

As you approach 90 knots airspeed, level the pitch attitude. Use the pedals to keep the ball centered. Adjust the collective for a torquemeter setting of 24 pounds.

At 90 knots airspeed, fly straight and level at an altitude of 2000 feet
Seg___ and a heading of 90°. (TONE)

Practice decelerating to 70 knots airspeed while maintaining a 90° heading and an altitude of 2000 feet. Fly straight and level for

thirty seconds and then accelerate to a 90 knots airspeed while holding a 90° heading and a 2000 foot altitude. When the controls are released to you, you will have enough time to get the helicopter under control before beginning the deceleration. You will receive a verbal signal to tell you when to begin the deceleration and when to begin the acceleration.

You will have two deceleration - acceleration practice sessions. If you should reach an out of control condition, the computer will reset you to the beginning of the deceleration.

Seg___ Stay clear of the controls while the computer sets the conditions for the first practice deceleration to 70 knots and acceleration to 90 knots. (TONE)

Msg___ WINDOW

Seg___ Push the continue button and take control of the simulator. (TONE)

Seg___ Begin deceleration. (TONE)

Seg___ Begin acceleration. (TONE)

Seg___ End of first practice. Stay clear of the controls. (TONE)

Msg___ WINDOW

Seg___ Push the continue button and take control of the simulator for the second practice. (TONE)

Seg___ Begin deceleration. (TONE)

Seg___ Begin acceleration. (TONE)

Seg___ End of practice. Stay clear of the controls. (TONE)

Msg___ WINDOW

Seg___ Notify console operator that you are ready for Session Three's tests. (TONE)

PERIOD 5

Msg___ WINDOW

Testing for today will consist of: first, a normal climb; second, a straight and level flight; third, a 180° level turn to the right; fourth, a straight and level flight; fifth, a 180° level turn to the left; sixth, a straight and level flight; seventh, a deceleration to 70 knots and an acceleration back to 90 knots; eighth, a straight and level flight; ninth, a normal descent and tenth, a straight and level flight. You will be flying this sequence of maneuvers continuously, however, you will receive a verbal signal telling you when to begin each maneuver. You may experience rough air conditions at any time. You will also be required to perform the communications task while flying these maneuvers. You will fly this sequence of maneuvers twice.

Seg___ Push the continue button and take control of the simulator. (TONE)

Seg___ Begin climb. (TONE)

Seg___ Begin right turn. (TONE)

Seg___ Begin left turn. (TONE)

Seg___ Begin deceleration. (TONE)

Seg___ Begin acceleration. (TONE)

Seg___ Begin descent. (TONE)

Seg___ Stay clear of the controls. (TONE)

Msg___ WINDOW

Testing will consist of: first, a normal climb; second a straight and level flight; third, a 180° level turn to the right; fourth, a straight

and level flight; fifth, a 180° level turn to the left; sixth, a straight and level flight; seventh, a deceleration to 70 knots and an acceleration back to 90 knots; eighth, a straight and level flight; ninth, a normal descent; and tenth, a straight and level flight. You may experience rough air at any time, and you are required to respond to the communications task.

Seg___ Push the continue button and take control of the simulator. (TONE)

Seg___ Begin climb. (TONE)

Seg___ Begin right turn. (TONE)

Seg Begin left turn. (TONE)

Seg___ Begin deceleration. (TONE)

Seg___ Begin acceleration. (TONE)

Seg___ *Begin descent.* (TONE)

Seg___ End of testing. Contact the console operator for further instruction. (TONE)

NOTE: Use second 12 minute Test period to initiate Session 4.

SESSION FOUR

PERIOD 6

Msg___ WINDOW

In the fourth session you will review descents, decelerations and accelerations and you will learn how to make climbing and descending

Seg___ turns. (TONE)

To descend 1000 feet at a rate of 500 feet per minute, you begin by simultaneously lowering the collective to a setting of 19 lbs. on the torquemeter and easing the cyclic back slightly to maintain an airspeed of 90 knots and a level attitude. You must also push on the right rudder pedal to counteract the decreased torque effect and keep the ball centered in the turn and slip indicator. You will hold the

NOTE: Review Option - 90° heading by using sideward movement of the cyclic. You will need to maintain a descent rate of 500 feet per minute. You should use the cyclic to make small changes in rate of descent. Use the collective to make changes of 150 feet or more in the descent rate.

You begin to level off from the descent when you are about 40 to 60 feet above the desired altitude. To level-off, raise the collective to a torque setting of 24 lbs., and at the same time, ease forward

Otherwise start with second 12 minute Test on Day 3 ---then go to Page 3 slightly on the cyclic to maintain an airspeed of 90 knots and a level attitude. Hold the heading of 90° and use the pedals to keep the ball centered.

At 1000 feet altitude, fly straight and level at an airspeed of 90 knots

Seg___ and a heading of 90° for ten seconds. (TONE)

Practice descending 1000 feet from an altitude of 2000 feet at a rate of 500 feet per minute while maintaining an airspeed of 90 knots, and a heading of 90°.

When the controls are released to you, you will have enough time to get your helicopter under control before beginning the descent. A verbal signal will tell you when to begin to descend.

If you should reach an out of control condition during the practice, the computer will reset you to the beginning of the descent.

Stay clear of the controls while the computer sets the conditions for the
Seg___ practice descent. (TONE)

Msg___ WINDOW

Seg___ Push the continue button and take control of the simulator. (TONE)

Seg___ Begin descent. (TONE)

Seg___ End of practice. Stay clear of the controls. (TONE)

Msg___ WINDOW

Seg___ Push the continue button. (TONE)

Seg___ Now for the deceleration and acceleration review. (TONE)

First, slowly lower the collective to begin the decrease in airspeed. At the same time ease the cyclic back to a slight nose high attitude to prevent a loss in altitude. Apply slight right pedal pressure to keep the ball centered in the turn and slip indicator. Maintain a heading of 90 degrees.

Continue lowering the collective until you have reached an airspeed of 70 knots. At 70 knots, check your torquemeter. If it does not read 20 pounds, adjust your collective until it does.

In order to fly at an airspeed of 70 knots and an altitude of 2000 feet, you will be in a slight nose high attitude. Use the cyclic to maintain altitude and zero vertical speed.

Seg___ Maintain 70 knots airspeed, an altitude of 2,000 feet and a heading of 90 degrees.
(TONE)

To begin the recovery to 90 knots airspeed, raise the collective slowly. At the same time, ease forward on the cyclic to maintain altitude. Apply left pedal to keep the ball centered in the turn and slip indicator. Maintain an altitude of 2000 feet and a heading of 90°.

As you approach 90 knots airspeed, level the pitch attitude. Use the pedals to keep the ball centered. Adjust the collective for a torque-meter setting of 24 pounds.

At 90 knots airspeed, fly straight and level at an altitude of 2000 feet

Seg and a heading of 90°. (TONE)

Practice decelerating to 70 knots airspeed while maintaining a 90° heading and an altitude of 2000 feet. Fly straight and level for thirty seconds and then accelerate back to a 90 knots airspeed while holding a 90° heading and a 2000 foot altitude. When the controls are released to you, you will have enough time to get the helicopter under control before beginning the deceleration. You will receive a verbal signal to tell you when to begin the deceleration and the acceleration.

If you should reach an out of control condition the computer will reset you to the beginning of the deceleration.

Stay clear of the controls while the computer sets the conditions for the practice deceleration to 70 knots and acceleration to 90 knots.

Seg___ (TONE)

Msg___ WINDOW

Seg___ Push the continue button and take control of the simulator. (TONE)

Seg___ Begin deceleration. (TONE)

Seg___ Begin acceleration. (TONE)

Seg___ End of practice. Stay clear of the controls. (TONE)

NOTE: Start here after second 12 minute Test from Day 3

The first new maneuver you will learn today is the climbing turn. For a climbing turn maneuver, you will be required to climb 500 feet at a rate

of 500 feet per minute, 90 knots airspeed and, at the same time, turn 180° to the left or right. If done correctly, you should roll out of the turn at the same time that you level off from the climb.

During the climbing turn instruction, the computer will demonstrate a 180° climbing turn to the right beginning at an altitude of 1000 feet, a heading of 90° and an airspeed of 90 knots. Place your hands on the collective and cyclic, your feet on the antitorque pedals and watch the instruments. (TONE)

To begin the climbing turn to the right, raise the collective to 29 lbs. torque for a 500 feet per minute climb rate. At the same time, ease forward slightly on the left pedal to keep the ball centered in the turn and slip indicator.

To begin the turn, ease the cyclic to the right until you have established a bank angle of 16°. Neutralize the cyclic at a 16° bank angle.

Maintain an airspeed of 90 knots by making slight adjustments with the cyclic.

Maintain a climb rate of 500 feet per minute by making small corrections with the cyclic and major adjustments of 150 feet per minute or more with the collective.

Maintain a bank angle of 16°. At 90 knots this is a standard rate turn, so keep the needle on the doghouse to the right on the turn indicator.

Keep the ball centered in the slip indicator.

To level off from the climbing turn, lower the collective to 24 lbs. torque at approximately 50 feet below the desired altitude of 1500 feet. At the same time, ease back slightly on the cyclic to maintain a 90 knots airspeed. Push on the right pedal to keep the ball centered.

Also, approximately 8° from the desired heading of 270°, begin to rollout from the turn. Ease the cyclic to the left to a wings level attitude on the attitude indicator.

Upon completion of the climbing turn, fly straight and level at an altitude of 1500 feet, a heading of 270°, and an airspeed of 90 knots for

Seg___ ten seconds. (TONE)

To make a climbing turn to the left you would ease the cyclic to the left and rollout in the same fashion as in the climbing turn to the right.

You will now practice a 180° climbing turn to the right and a 180° climbing turn to the left, beginning at an altitude of 1000 feet, a heading of 90° and an airspeed of 90 knots. When the controls are released to you, you will be given enough time to get the UH-1 Flight Simulator under control before beginning the climbing turn. You will receive a verbal signal to tell you when to begin the climbing turn.

If you should reach an out of control condition, the computer will reset you to the initial conditions.

Stay clear of the controls while the computer sets the condition for a

Seg___ 180° climbing turn to the right. (TONE)

Msg___ WINDOW

Seg___ Push the continue light and take control of the simulator. (TONE)

Seg___ Begin climbing turn to the right. (TONE)

Seg___ Stay clear of the controls. (TONE)

Msg___ WINDOW

Push the continue button and take the controls for a climbing turn

Seg___ to the left. (TONE)

Seg___ Begin climbing turn to the left. (TONE)

Seg___ Stay clear of the controls. (TONE)

Msg___ WINDOW

Seg___ Push the continue button. (TONE)

Descending turns are very similar to climbing turns with the major difference being that the collective is lowered instead of raised. For a descending turn you will be required to descend 500 feet at a rate of 500 feet per minute, 90 knots airspeed and, at the same time, turn 180° to the left or right. Again, if done correctly, you should roll out of the turn at the same time that you are leveling off from the descent.

As you listen to the descending turn instruction, the computer will demonstrate a 180° descending turn to the left, beginning at an altitude of 1500 feet, a heading of 90° and an airspeed of 90 knots. Place your

Seg___ hands and feet on the controls and watch the instruments. (TONE)

To begin the descending turn to the left, simultaneously lower the collective to 19 lbs. torque for a 500 feet per minute descent rate and ease the cyclic back to maintain 90 knots airspeed. Push the right pedal to keep the ball centered.

Ease the cyclic to the left to establish a bank angle of 16° and neutralize the cyclic at 16°.

Maintain an airspeed of 90 knots by making small adjustments with the cyclic.

Maintain a descent rate of 500 feet per minute by making small corrections with the cyclic and major adjustments of 100 feet per minute or more with the collective.

Maintain a bank angle of 16°. At 90 knots this is a standard rate turn, so check the turn indicator.

Keep the ball centered in the slip indicator.

Begin the level-off approximately 50 feet above the desired heading of 1000 feet and the rollout at approximately 8° from the desired heading of 270°. To level off from the descent, lower the collective to 24 lbs. and at the same time ease forward slightly on the cyclic to maintain 90 knots airspeed. Push on the left pedal if necessary to keep the ball centered.

To rollout from the turn, ease the cyclic to the right to a wings level
Seg___ attitude on the attitude indicator. (TONE)

When you have reached 1000 feet altitude and 270° heading, fly straight and level for ten seconds.

In a descending turn to the right, ease the cyclic to the right to begin the turn and to the left to rollout. Otherwise, complete the descending turn to the right as you complete the descending turn to the left.

You will now practice a 180° descending turn to the left and a 180° descending turn to the right beginning at an altitude of 1500 feet, a heading of 90° and an airspeed of 90 knots. When the controls are released to you, you will be given enough time to get the simulator under control before beginning the descending turn. You will receive a verbal signal indicating when to begin the descending turn.

If you should reach an out of control condition, the computer will stop the flight simulator and reset you to the initial conditions.

Stay clear of the controls while the computer sets the conditions for a
Seg___ 180° descending turn to the left. (TONE)

Msg___ WINDOW

Seg___ Push the continue button and take over the controls. (TONE)

Seg___ Begin descending turn to the left. (TONE)

Seg___ Stay clear of the controls. (TONE)

Msg___ WINDOW

Seg___ Push the continue button and take the control for a descending turn to the right. (TONE)

Seg___ Begin descending turn to the right. (TONE)

Seg___ Stay clear of the controls. (TONE)

Msg___ WINDOW

Seg___ Notify console operator that you are ready for Session Four's tests. (TONE)

PERIOD 7

Msg___ WINDOW

Testing for today is as follows: first, a normal climb; second, straight and level flight; third, a 180° level turn to the right; fourth, straight and level flight; fifth, a 180° level turn to the left; sixth, straight and level flight; seventh, a deceleration to 70 knots and an acceleration back to 90 knots; eighth, straight and level flight; ninth, a normal descent; tenth, straight and level flight; eleventh, a climbing turn to the left; twelfth, straight and level flight; and thirteenth, descending turn to the right. You may experience rough air at any time. You will also be required to perform the communications task while flying these maneuvers. You will fly this sequence of maneuvers twice. You will receive a verbal signal letting you know when to begin each maneuver.

Seg___ Push the continue button and take control of the simulator for testing. (TONE)

Seg___ Begin climb. (TONE)

Seg___ Begin right turn. (TONE)

Seg___ Begin left turn. (TONE)

Seg___ Begin deceleration. (TONE)

Seg___ Begin acceleration. (TONE)

Seg___ Begin descent. (TONE)

Seg___ Begin climbing turn to the left. (TONE)

Seg___ Begin descending turn to the right. (TONE)

Seg___ Stay clear of the controls. (TONE)

Msg___ WINDOW

Testing will be as follows: first, a normal climb; second, straight and level flight; third, a 180° level turn to the right; fourth, straight and level flight; fifth, a 180° level turn to the left; sixth, straight and level flight; seventh, a deceleration to 70 knots and an acceleration back to 90 knots; eighth, straight and level flight; ninth, a normal descent; tenth, straight and level flight; eleventh, a climbing turn to the left; twelfth, straight and level flight and thirteenth, a descending turn to the right. You may experience rough air at any time. You will also be required to perform the communications task.

Seg ___ Push the continue button and begin the testing. (TONE)

Seg__ Begin climb. (TONE)

Seg___ Begin right turn. (TONE)

Seg___ Begin left turn. (TONE)

Seg___ Begin deceleration. (TONE)

Seg___ Begin acceleration. (TONE)

Seg___ Begin descent. (TONE)

Seg___ Begin climbing turn to the left. (TONE)

Seg___ Begin descending turn to the right. (TONE)

Seg___ End of testing. Contact the console operator for further instructions. (TONE)

SESSION FIVE

PERIOD 8

Msg___ WINDOW/TONE

Seg___

During today's session, you will be tested on climbing and descending turns, and you will receive instruction on a radio navigation tracking task using VOR which is the Very High Frequency Omni Direction Range navigation system.

You will now be tested on a 180° climbing turn to the right, beginning at an altitude of 1000 ft., a heading of 90°, and an airspeed of 90 knots. After reaching your altitude and heading, fly straight and level. When the controls are released to you, you will be given enough time to get the flight simulator under control before beginning the climbing turn. You will receive a verbal signal to tell you when to begin the climbing turn.

Seg___ Stay clear of the controls while the computer sets the conditions for a 180° climbing turn to the right. (TONE)

Msg___ WINDOW

Seg___ Push the continue button and take control of the simulator. (TONE)

Seg___ Begin climbing turn to the right. (TONE)

Seg___ Stay clear of the controls. (TONE)

Msg___ WINDOW

Seg___ Push the continue button. (TONE)

You will now be tested on a 180° descending turn to the left beginning at an altitude of 1500 ft., 90° heading and 90 knots airspeed. You will

fly straight and level after reaching the desired altitude and heading. When the controls are released to you, you will be given enough time to get the simulator under control before beginning the descending turn.

Stay clear of the controls while computer sets the conditions for a Seg 180° descending turn to the left. (TONE)

Msg___ WINDOW

Seg___ Push the continue button and take control of the simulator. (TONE)

Seg___ Begin descending turn to the left. (TONE)

Seg___ Stay clear of the controls. (TONE)

Seg___ Push the continue button. (TONE)

You will now learn to perform the VOR tracking task. VOR tracking enables a pilot to maintain his course while flying cross-country. In order to fly a course using VOR, you will be using the NAV-COM VHF radio set and the VOR course indicator.

The NAV-COMM radio set is located on the upper left hand side of the radio panel. At the top of this radio set are the words NAV-COMM. The power switch is located on the left side of the radio set. Make sure that it is turned to the POWER selection. The NAV-COMM radio should read 109.2. If it does not, the whole megahertz channel selector knob is located on the left side of the radio set. The fractional megahertz channel selector knob is located on the right side.

The VOR Course Indicator is the instrument directly below the Radio Magnetic Indicator. You will be positioned west of the VOR station and will track directly to the VOR on a 90° course. The course indicator should be set at 90° at the top. If it is not, rotate the course selector knob on the botton right hand corner until the course indicator reads 090°. (PAUSE 10 seconds) The course selector setting will move only when you rotate the knob.

You will use the course selector to pick the course that you want to fly. 90° on the course selector will allow you to fly inbound to the station.

In the lower right quadrant is a white triangle that will say either TO or FROM. It will say TO when the course you have selected will take you to the station. It will change to FROM when you cross over the station on that same course and continue flying away from it.

In the middle of the course indicator is a vertical needle that shows whether or not you are on the selected course (or radial). When the needle swings to the right, it means that the course is to the pilot's right and he must turn to the right to get back on course. If it swings to the left, the selected course is to the left and the pilot must turn to the left to get back on course. When the needle is centered, the aircraft is on the course which is set under the course selector index.

For the VOR tracking task you will be placed west of the station on a 90° course at an altitude of 1000 ft. and an airspeed of 90 knots. You will then decelerate to an airspeed of 70 knots by smoothly reducing power to 20 lbs. torque. Maintain an altitude of 1000 ft. and an inbound track to the station by keeping the course indicator's vertical needle centered.

Keep the ball centered in the turn and slip indicator.

Upon reaching 70 knots airspeed, track inbound to the VOR station. Maintain an airspeed of 70 knots, and an altitude of 1000 ft. Keep the vertical needle on the course indicator centered after station passage. Maintain an airspeed of 70 knots, and an altitude of 1000 ft. Keep the ball centered in the turn and slip indicator.

Practice tracking inbound to the station on the 90° course while maintaining an altitude of 1000 ft. Reduce airspeed to 70 knots and continue tracking to station passage.

When the controls are released to you, you will have enough time to get the helicopter under control before beginning the deceleration and tracking task.

If you should reach an out of control condition the computer will reset you to the beginning of the tracking task. You will practice VOR tracking twice.

Seg___ Stay clear of the controls while the computer sets the conditions for the first VOR tracking task. (TONE)

Msg___ WINDOW

Seg___ Push the continue button and take control of the simulator. (TONE)

Seg___ Begin deceleration and tracking. (TONE)

Seg___ Stay clear of the controls. (TONE)

Msg___ WINDOW

Seg___ Push the continue button to begin the second practice. (TONE)

Seg___ Begin deceleration and tracking. (TONE)

Seg___ Stay clear of the controls. (TONE)

Msg___ WINDOW

Seg___ Notify the console operator that you are ready for Session Five's tests. (TONE)

PERIOD 9

TESTING

Testing is as follows: 1st, VOR TRACKING; 2nd, an acceleration back to 90 knots; 3rd, straight and level flight; 4th, a normal climb; 5th, a 180° level turn to the right; 6th, straight and level flight; 7th, a 180° level turn to the left; 8th, straight and level flight; 9th, a normal descent; 10th, straight and level flight; 11th, a climbing turn to the left; 12th, straight and level flight; 13th, a descending turn to the right; and 14th, straight and level flight. You will also be required to perform the communications task while flying these maneuvers. You may experience rough air at any time. You will receive a verbal signal to tell you when to begin each maneuver. You will repeat this sequence of testing 3 times.

Seg___ Push the continue button to take control of the simulator. (TONE)

Seg___ Begin deceleration and VOR tracking. (TONE)

Seg___ Begin acceleration. (TONE)

Seg___ Begin climb. (TONE)

Seg___ Begin right turn. (TONE)

Seg___ Begin left turn. (TONE)

Seg___ Begin descent. (TONE)

Seg___ Begin climbing turn to the left. (TONE)

Seg___ Begin descending turn to the right. (TONE)

Seg___ Stay clear of the controls. (TONE)

[NOTE: this sequence of testing will be repeated two more times].

APPENDIX E

CONSOLE OPERATOR'S HANDBOOK AND MANEUVER GUIDE

CONSOLE OPERATOR'S PASS HANDBOOK

INTRODUCTION

PASS or the Proficiency-based Aviator Selection System is a program developed by the Human Performance Laboratory of the McDonnell Douglas Corporation. It is an experimental program designed to aid the Army in revising its current procedures for selecting candidates for Rotary Wing Aviator Training. If this approach is successful, it may be incorporated in future selection procedures. However, candidate participation in this, the early stages of the program, is for system evaluation and data collection purposes only. Performance during PASS training will in no way affect candidacy to Rotary Wing Aviator Training, nor will it affect future training.

PASS is a five-hour sample of rotary wing flight tasks that are taught in the UH-1 Flight Simulator using the automatic training capability of the flight simulator. After one hour of precockpit instruction in how to read the instruments, the PASS candidate will enter the UH-1 flight simulator cockpit without an instructor for five one-hour sessions of flight training and testing. It is assumed that few PASS candidates will have had prior flight training of any kind and that, therefore, they will be unacquainted with standard cockpit procedures. Additionally, they are likely to be apprehensive and unsure of their actions. As the most highly visible person within the PASS training loop, you, the console operator, can do the most to allay their fears, settle them into the training environment and keep the program running smoothly.

The PASS selection program utilizes specially designed software programs, audio-instructional tapes and an audio-feedback system. Thus, all four cockpits will be dedicated to PASS training selection and it will not be possible to use any one cockpit for non-PASS training in the "Auto" mode. For example, you may encounter a situation when three of the four cockpits are filled with PASS candidates and a non-PASS flight student and instructor want to use the fourth cockpit. They may use this cockpit, but only in the "Semi-Auto" mode. Additionally, the PASS software package does not include such items as the malfunctions' program, slow time, turbulence level, replay, wind-direction and velocity change and some of the NAV-aids that are part of the normal UH-1 training in the flight simulator.

PASS record data will be transferred to permanent storage at the end of each session. Note, however, that the PASS data from all four cockpits must be stored on the tape unit before the next session can begin. For example, if the person assigned to cockpit four completes his/her PASS session before the other PASS candidates, no one can use that cockpit until all have finished their sessions and the data records have been transferred.

Your support and assistance is very important to the success of this program. We have provided the following handbook to help you in completing these additional selection tasks. We would like to thank you at this point for your cooperation and help.

I. ROLE OF THE CONSOLE OPERATOR

As previously stated in the introduction, your primary role is to assist the PASS student through each of the five one-hour sessions. Because we are primarily interested in how well each student performs given the same set of instructions in the UH-1 flight simulator, it is important that he/she not receive instructions from any other source. You may answer any noninstructional questions that a student may ask. Do not answer any questions concerning how to read any of the instruments, how to use any of the controls, nor how to perform any of the maneuvers. Do not offer any advice as to how he/she may improve his/her performance. And, do not offer any evaluations as to how well or how poorly the student may have done even if the student asks. It is important that you remain completely neutral. Your tasks, then, with respect to PASS will be to:

- o set initial conditions for each session
- o enter PASS candidate identification into data base
- o hand out instructional guide material
- o help the PASS candidate become familiar with the cockpit
- o initialize training and testing sequences for each session
- o monitor progress
- o take corrective action when indicated.

A. Set Initial Conditions for each Session

The nav radios, force trim, cyclic friction, throttle and other related cockpit functions must be checked so that all items are in conformance with PASS Control Procedure Guidelines. This assures that all PASS candidates are trained under the same conditions. The checklist for the cockpit set-up for each session is included in Section II of this handbook.

B. Enter PASS Identification into Data Base

Each time a candidate reports for a PASS training session, his/her PASS identification number, must be entered into the system so that the performance record can be matched to the student. PASS identification numbers will be assigned by ARI.

C. Hand Out Instructional Guides

For each session, there is a student guide, listing, in sequence, the training events for that day. These guides are to be handed to the PASS candidate before entering the cockpit. The guides are to be used as a reference list during the training and testing session.

D. Help PASS Candidate become Familiar with the Cockpit

Before the PASS candidate begins Session One Training you will have to point out the seat and pedal adjustment levers, the headset plug-in receptacle, the volume control on the comm panel, the location of the auto training control panel and the instructor call button. Additionally, you should make sure that he/she has made the proper seat adjustments, fastened the seat belt and shoulder harness, put on the headset and then check to make sure that all three doors are closed.

E. Initialize Training and Testing Sequence for each Session

Using the scenario of training event set-up points for each session, you will need to dial in the appropriate three digit number on your thumbwheel and press the set-up button to begin the training session or testing sequence.

F. Monitor Progress

Because the PASS Candidate will be alone in the cockpit during each training session, it will be necessary to monitor progress, or lack of progress. Particular attention should be given to excessively long set-up times between maneuvers. If the PASS candidate is in an unusual attitude at the end of a maneuver or if he/she crashes, the system may not set up the next maneuver. When this happens, you will have to intervene and manually dial in the maneuver sequence number and press the set-up point. Maneuver sequence numbers can be quickly obtained by checking the APU slot on your console display for each cockpit. The APU number displayed is the set-up number for the next maneuver.

Another problem may arise during practice sessions where the software is designed so that when the PASS candidate reaches an out of control condition, the system is supposed to automatically take over and reset to the initial conditions of the practice. Sometimes it may fail to reset and at other times it may continually recycle to the practice session and will not proceed to the next training sequence. You will again have to determine the number of the next set-up point and manually initialize the PASS candidate into the next sequence of activities.

You should also monitor the initial moments of training for each session to determine if the candidate is at the proper training segment. In each of these instances, the candidate has been told to contact you but he/she may not always be aware that the problem exists. This will be especially true of the first day's training session. Additionally, you are to use your discretion in terminating a training or practice session if you feel that the PASS candidate is in serious trouble. The PASS candidate is not taught the function of the "freeze" button so it will be up to you to freeze the motion from the console. It is hoped that this action is not necessary but, if it is, please record the name, date, session, maneuver and cause.

G. Take Corrective Action where Indicated

See above. For additional corrective actions, refer to your standard operating procedures for emergency situations.

GOOD LUCK

II. GENERAL PROCEDURES FOR SESSIONS I THROUGH V

A. In each Cockpit:

1. Check to make sure that the cockpit lights and fan are on.
2. Switch Force Trim to OFF position.
3. Rotate cyclic friction counterclockwise to the OFF position.
4. Rotate the throttle to the FULL ON position.
5. Turn the VOLUME down on all NAV radios.
6. Set the NAV-COMM radio to 109.2.
7. Set the UHF radio to the T/R&G and preset channel control positions.
8. Set the course indicator to 090°.
9. Turn ILS marker beacon to OFF position.

B. At the Console:

1. Set sound power level to zero.
2. Enter student identification number into line 19 of the assigned cockpit number on your console display.
3. Hand out student guides.
4. Follow the instructions for each session.

C. At the end of a session.

1. Set all cockpit auto training thumbwheel dials to 000 after all PASS sessions have ended.
2. Press the set-up button.

III. SESSION ONE PROCEDURES

A. Hand out "Student Supplement" and Session-One Sequence of Instruction.

B. Enter PASS candidate I.D. number.

C. Familiarize Student with assigned cockpit.

1. Help student to adjust the seat for height and fore-aft position and the pedals for length.

2. Make sure student fastens seat belt and shoulder harness.

3. Show student the location of the headset jack.

4. Point out the locations and functions of the signal distribution panel, the auto training panel, and the instructor call button.

D. Enter 100 on the console thumbwheel and press the set-up button.

E. Monitor candidate progress.

F. NOTE: For the communications side task the candidate is required to check-in on a given UHF preset channel. This requires no response from the console operator.

IV. SESSION TWO PROCEDURES

A. Hand out "Session Two - Sequence of Instruction."

B. Enter PASS candidate I.D.

C. Enter 200 on the console thumbwheel and press the set-up button.

D. Upon completion of Session Two training, the candidate will contact you and tell you that he is ready for Session Two testing. Dial in 300 on your thumbwheel and press the set-up button.

E. Monitor progress.

V. SESSION THREE PROCEDURES

A. Hand out "Session Three Sequence of Instruction."

B. To begin Session Three with review testing, dial in 320 on your thumb-wheel and press the set-up botton.

C. To begin Session Three - new instruction - dial in 426 and press the set-up button.

D. To begin Session Three testing dial in 500 and press the set-up button.

E. Monitor progress.

VI. SESSION FOUR PROCEDURES

A. Hand out "Session Four - Sequence of Instruction."

B. To begin Session four review testing, dial in 532 and press the set-up button.

C. To begin Session Four's new instruction, dial in 627 and press the set-up button.

D. To begin Session Four's testing, dial in 700 and press the set-up button.

E. Monitor progress.

VII. SESSION FIVE PROCEDURES

A. Handout "Session Five - Sequence of Instruction."

B. To begin Session Five dial in 800 and press the set-up button. (NOTE: Review Testing for Session Five does not require a separate set-up point number.)

C. To begin Session Five testing, dial in 900 and press the set-up button.

D. Monitor progress.

Session One

UH-1FS Sequence of Instruction

Segment Set-Up #	Description
100	Instruction, Demonstration and Practice: Use of the cyclic.
110	Instruction, Demonstration and Practice: Use of the Antitorque Pedals.
114	Instruction, Demonstration and Practice: Reading the Attitude Indicator for Pitch.
122	Instruction, Demonstration and Practice: Reading the Airspeed Indicator.
131	Instruction, Demonstration and Practice: Reading the Altimeter.
137	Instruction, Demonstration and Practice: Reading the Attitude Indicator for Roll.
146	Instruction: Reading the Turn and Slip Indicator. Reading the Radio Magnetic Indicator (RMI) Flying Straight and Level
148	Practice: Straight and Level Flight. Altitude - 2000 ft Airspeed - 90 knots Heading - 90°
151	Repeat Practice - Straight and Level Flight
154	Instruction: Flying Straight and Level in Rough Air.
156	Practice: Straight and Level Flight in Rough Air. Altitude - 2000 ft Airspeed - 90 knots Heading - 90°
159	Repeat Practice - Straight and Level Flight in Rough Air.

Segment Set-Up #	Description
162	Instruction and Practice: Communications Task using the UHF radio set.
166	Testing: Straight and Level Flight. Altitude - 2000 ft Airspeed - 90 knots Heading - 90°

Session Two

UH-1FS Sequence of Instruction

Segment Set-Up #	Description
200	Review Test - Straight and Level Flight. Altitude - 2000 ft Airspeed - 90 knots Heading - 90° Time - 3 min
	Review - Attitude Indicator - Roll only.
206	Instruction and Demonstration - 180° level turn to the left.
212	Practice - 180° level turn to the left. Heading (Begin) - 90° Altitude - 2000 ft Airspeed - 90 knots Bank Angle - 16° Heading (End) - 270°
221	*Repeat Practice* - 180° Level Turn to the Left.
230	Instruction and Demonstration - 180° level turn to the right.
234	Practice 180° level turn to the right. Heading (Begin) - 90° Altitude - 2000 ft Airspeed - 90 knots Bank Angle - 16° Heading (End) - 270°
243	Repeat Practice - 180° Level Turn to the Right.
252	Instruction, Demonstration and Practice - Use of the Collective.
256	Instruction and Practice - Reading the Torquemeter.
261	Instruction and Practice - Reading the Vertical Speed Indicator.

Segment Set-Up #	Description
267	Instruction and Demonstration - Normal Climb.
271	Practice - Normal Climb Altitude (Begin) - 1000 ft Heading - 90° Airspeed - 90 knots Vertical Speed - 500 ft per min climb Altitude (End) - 2000 ft
280	Repeat Practice - Normal Climb.
289	Message to Contact Console Operator to Begin Testing.
300	Testing A. Normal Climb Altitude (Begin) - 1000 ft Heading - 90° Airspeed - 90 knots Vertical Speed - 500 ft per min climb Altitude (End) - 2000 ft B. Straight and Level Flight Altitude - 2000 ft. Airspeed - 90 knots Heading - 90° C. 180° level turn to the right Heading (Begin) - 90° Altitude - 2000 ft Airspeed - 90 knots Bank Angle - 16° Heading (End) - 270° D. Straight and Level Flight Altitude - 200 ft Airspeed - 90 knots Heading - 270° E. 180° level turn to the left Heading (Begin) - 270° Altitude - 2000 ft Airspeed - 90 knots Bank Angle - 16° left Heading (End) - 90° F. Straight and Level Flight Altitude - 2000 ft Airspeed - 90 knots Heading - 90°

Segment Set-Up #	Description
320	Repeat Testing Sequence.

Session Three

UH-1FS Sequence of Instruction

Segment Set-Up #	Description
320	Review test.
	A. Normal Climb Altitude (Begin) - 1000 ft Heading - 90° Airspeed - 90 knots Vertical Speed - 500 ft per min climb Altitude (End) - 2000 ft
	B. Straight and Level Flight Review Altitude - 2000 ft Airspeed - 90 knots Heading - 90°
	C. 180° level turn to the right Heading (Begin) - 90° Altitude - 2000 ft Airspeed - 90 knots Bank Angle - 16° right Heading (End) - 270°
	D. Straight and Level Flight Altitude - 2000 ft Airspeed - 90 knots Heading - 270°
	E. 180° level turn to the left Heading (Begin) - 270° Altitude - 2000 ft Airspeed - 90 knots Bank Angle - 16° left Heading (End) - 90°
	F. Straight and Level Altitude - 2000 ft Airspeed - 90 knots Heading - 90°
426	Instruction and Demonstration - Normal Descent.
430	Practice: Normal Descent Altitude (Begin) - 2000 ft Heading - 90° Airspeed - 90 knots Vertical Speed - 500 ft per min Altitude (End) - 1000 ft

Segment Set-Up#	Description
439	(Repeat Practice)
448	Instruction and Demonstration - Deceleration/Acceleration.
454	Practice - Deceleration/Acceleration. Airspeed (Begin) - 90 knots Altitude - 2000 ft Heading - 90° Airspeed (End Deceleration) - 70 knots Airspeed (End Acceleration) - 90 knots
463	(Repeat Practice)
472	Notify console operator
500	Testing Review A. Normal Climb Altitude (Begin) - 1000 ft Heading - 90° Airspeed - 90 knots Vertical Speed - 500 ft per min Altitude (End) - 2000 ft B. Straight and Level Flight Altitude - 2000 ft Airspeed - 90 knots Heading - 90° C. 180° Level Turn to the Right Heading (Begin) - 90° Altitude - 2000 ft Airspeed - 90 knots Bank Angle - 16° right Heading (End) - 270° D. Straight and Level Flight Altitude - 2000 ft Airspeed - 90 knots Heading - 270° E. 180° Level Turn to the Left Heading (Begin) - 270° Altitude - 2000 ft Airspeed - 90 knots Bank Angle - 16° left Heading (End) - 90°

Segment Set-Up #	Description
	F. Straight and Level Flight Altitude - 2000 ft Airspeed - 90 knots Heading - 90°
	G. Deceleration/Acceleration Airspeed (Begin) - 90 knots Altitude - 2000 ft Heading - 90° Airspeed (End deceleration) - 70 knots Airspeed (End acceleration) - 90 knots
	H. Straight and Level Flight Altitude - 2000 ft Airspeed - 90 knots Heading - 90°
	I. Normal Descent Altitude (Begin) - 2000 ft Airspeed - 90 knots Heading - 90° Vertical Speed - 500 ft per min descent Altitude (End) - 1000 ft
	J. Straight and Level Flight Altitude - 1000 ft Airspeed - 90 knots Heading - 90°
532	Repeat Testing Sequence.

Session Four

UH-IFS Sequence of Instruction

Segment Set-Up #	Description
532	Review Testing

A. Normal Climb
Altitude (Begin) - 1000 ft.
Heading - 90°
Airspeed - 90 knots
Vertical Speed - 500 ft. per minute climb
Altitude (End) - 2000 ft.

B. Straight and Level Flight
Altitude - 2000 ft.
Airspeed - 90 knots
Heading - 90 heading

C. 180° Level Turn to the Right
Heading (Begin) - 90°
Altitude - 2000 ft.
Airspeed - 90 knots
Bank Angle - 16°
Heading (End) - 270°

D. Straight and Level Flight
Altitude - 2000 ft.
Airspeed - 90 knots
Heading - 270°

E. 180° Level Turn to the Left
Heading (Begin) - 270°
Altitude - 2000 ft.
Airspeed - 90 knots
Bank Angle - 16° left
Heading (End) - 90°

F. Straight and Level Flight
Altitude - 2000 ft.
Airspeed - 90 knots
Heading - 90°

G. Deceleration/Acceleration
Airspeed (Begin) - 90 knots
Altitude - 2000 ft.
Heading - 90°
Airspeed (End Deceleration) - 70 knots
Airspeed (End Acceleration) - 90 knots

Session Four (Contd)

H. Straight and Level Flight
Altitude - 2000 ft.
Airspeed - 90 knots
Heading - 90°

I. Normal Descent
Altitude (Begin) - 2000 ft.
Airspeed - 90 knots
Heading - 90 degrees
Vertical Speed - 500 ft. per minute descent
Altitude (End) - 1000 ft.

J. Straight and Level Flight
Altitude - 1000 ft.
Airspeed - 90 knots
Heading - 90°

627 Instructions and Demonstration - Climbing Turns.

631 Practice 180° Climbing Turn to the Right.
Altitude (Begin) - 1000 ft.
Heading (Begin) - 90°
Airspeed - 90 knots
Vertical Speed - 500 ft. per minute climb
Bank Angle - 16° right
Altitude (End) - 1500 ft.
Heading (End) - 270°

640 Practice 180° Climbing Turn to the Left
Altitude (Begin) - 1000 ft.
Heading (Begin) - 90°
Airspeed - 90 knots
Vertical Speed - 500 ft. per minute climb
Bank Angle - 16° left
Altitude (End) - 1500 ft.
Heading (End) - 270°

649 Instruction and Demonstration - Descending Turns.

653 Practice - 180° Descending Turn to the Left.
Altitude (Begin) - 1500 ft.
Heading (Begin) - 90°
Airspeed - 90 knots
Vertical Speed - 500 ft. per minute descent
Bank Angle - 16° left
Altitude (End) - 1000 ft.
Heading (End) - 270°

Session Four (Contd)

Segment Set-up #	Description
662	Practice 180° Descending Turn to the Right. Altitude (Begin) - 1500 ft. Heading (Begin) - 90° Airspeed - 90 knots Vertical Speed - 500 ft. per minute descent Bank Angle - 16° Altitude (End) - 1000 ft. Heading (End) - 270°
671	Message to notify console operator to begin testing.
700	Testing A. Normal Climb Altitude (Begin) - 1000 ft. Heading - 90° Airspeed - 90 knots Vertical Speed - 500 ft. per minute Altitude (End) - 2000 ft. B. Straight and Level Flight Altitude - 2000 ft. Airspeed - 90 knots Heading - 90° C. 180° Level Turn to the Right Heading (Begin) - 90° Altitude - 2000 ft. Airspeed - 90 knots Bank Angle - 16° right Heading (End) - 270° D. Straight and Level Flight Altitude - 2000 ft. Airspeed - 90 knots Heading - 270° E. 180° Level Turn to the Left Heading (Begin) - 270° Altitude - 2000 ft. Airspeed - 90 knots Bank Angle - 16° left Heading (End) - 90° F. Straight and Level Flight Altitude - 2000 ft. Airspeed - 90 knots Heading - 90°

Session Four (Contd)

Segment Set-Up #	Description
	G. Deceleration/Acceleration Airspeed (Begin) - 90 knots Altitude - 2000 ft. Heading - 90° Airspeed (End Deceleration) - 70 knots Airspeed (End Acceleration) - 90 knots
	H. Straight and Level Flight Altitude - 2000 ft. Airspeed - 90 knots Heading - 90°
	I. Normal Descent Altitude (Begin) - 2000 ft. Airspeed - 90 knots Heading - 90° Vertical Speed - 500 ft. per minute descent Altitude (End) - 1000 ft.
	J. Straight and Level Flight Altitude - 1000 ft. Airspeed - 90 knots Heading - 90°
	K. 180° Climbing Turn to the Left Altitude (Begin) - 1000 ft. Heading (Begin) - 90° Airspeed - 90 knots Vertical Speed - 500 ft. per minute climb Bank Angle - 16° left Altitude (End) - 1500 ft. Heading (End) - 270°
	L. Straight and Level Flight Altitude - 1500 ft. Airspeed - 90 knots Heading - 270°
	M. 180° Descending Turn to the Right Altitude (Begin) - 1500 ft. Heading (Begin) - 270° Airspeed - 90 knots Vertical Speed - 500 ft. per minute descent Bank Angle - 16° right Altitude (End) - 1000 ft. Heading (End) - 90°

Session Four (Contd)

Segment Set-Up #	Description
	N. Straight and Level Flight Altitude - 1000 ft. Airspeed - 90 knots Heading - 90°
	Repeat Testing Sequence. (The program will automatically loop back to 700 for the second testing sequence.

Session Five

UH-IFS Sequence of Instruction

Segment Set-UP #	Description
800	Review Test A. 180° Climbing Turn to the Right Altitude (Begin) - 1000 ft. Heading (Begin) - 90° Airspeed - 90 knots Vertical Speed - 500 ft. per minute climb Bank Angle - 16° Altitude (End) - 1500 ft. Heading (End) - 270°
811	B. 180° Descending Turn to the Left Altitude (Begin) - 1500 ft. Heading (Begin) - 90° Airspeed - 90 knots Vertical Speed - 500 ft. per minute descent Bank Angle - 16° left Altitude (End) - 1000 ft. Heading (end) - 270°
822	Instruction - VOR Tracking
824	Practice - VOR Tracking Airspeed - 70 knots Altitude - 1000 ft. Course - 90° (West of the station)
832	(Repeat Practice)
840	Notify the console operator that you are ready for test
900	Testing A. VOR Tracking Altitude - 1000 ft. Airspeed - 70 knots Course - 90° (West of the station) B. Acceleration Airspeed (Begin) - 70 knots Altitude - 1000 ft. Heading - 90° Airspeed (End) - 90 knots C. Straight and Level Flight Altitude - 1000 ft. Airspeed - 90 knots Heading - 90°

Session Five (Contd)

D. Normal Climb
Altitude (Begin) - 1000 ft.
Airspeed - 90°
Heading - 90°
Vertical Speed - 500 ft. per minute climb
Altitude (End) - 2000 ft.

E. Straight and Level Flight
Altitude - 2000 ft.
Airspeed - 90 knots
Heading - 90°

F. 180° Level Turn to the Right
Heading (Begin) - 90°
Altitude - 2000 ft.
Airspeed - 90 knots
Bank Angle - 16° right
Heading (End) - 270°

G. Straight and Level Flight
Altitude - 2000 ft.
Airspeed - 90 knots
Heading - 270°

H. 180° Level Turn to the Left
Heading (Begin) - 270°
Altitude - 2000 ft.
Airspeed - 90 knots
Bank Angle - 16° left
Heading (End) - 90°

I. Straight and Level Flight
Altitude - 2000 ft.
Airspeed - 90 knots
Heading - 90°

J. Normal Descent
Altitude (Begin) - 2000 ft.
Airspeed - 90 knots
Heading - 90°
Vertical Speed - 500 ft. per minute descent
Altitude (End) - 1000 ft.

K. Straight and Level Flight
Altitude - 1000 ft.
Airspeed - 90 knots
Heading - 90°

L. 180° Climbing Turn to the Left
Altitude (Begin) - 1000 ft.
Heading (Begin) - 90°

Session Five (Contd)

L. Airspeed - 90 knots
Vertical Speed - 500 ft. per minute climb
Bank Angle - 16° left
Altitude (End) - 1500 ft.
Heading (End) - 270°

M. Straight and Level Flight
Altitude - 1500 ft.
Heading - 270°
Airspeed - 90 knots

N. 180° Descending Turn to the Right
Altitude (Begin) - 1500 ft.
Heading (Begin) - 270°
Airspeed - 90 knots
Vertical Speed - 500 ft. per minute descent
Bank Angle - 16° left
Altitude (End) - 1000 ft.
Heading (End) - 90°

O. Straight and Level Flight
Altitude - 1000 ft.
Airspeed - 90 knots
Heading - 90°

900 Repeat Testing Sequence.

900 Repeat Testing Sequence.

APPENDIX F

STUDENT GUIDE

Students Guide

Session One

UH-1FS Sequence of Instruction

1. Instruction, Demonstration and Practice: Use of the cyclic.

2. Instruction, Demonstration and Practice: Use of the Anti-Torque Pedals.

3. Instruction, Demonstration and Practice: Reading the Attitude Indicator for Pitch.

4. Instruction, Demonstration and Practice: Reading the Airspeed Indicator.

5. Instruction, Demonstration and Practice: Reading the Altimeter.

6. Instruction, Demonstration and Practice: Reading the Attitude Indicator for Roll.

7. Instruction: Reading the Turn and Slip Indicator.

8. Instruction: Reading the Radio Magnetic Indicator (RMI) for Heading.

9. Instruction: Flying Straight and Level

10. Practice: Straight and Level Flight.
    Altitude - 2000 ft.
    Airspeed - 90 knots
    Heading - 90°

11. Instruction: Flying Straight and Level in Rough Air.

12. Practice: Straight and Level Flight in Rough Air.
    Altitude - 2000 ft.
    Airspeed - 90 knots
    Heading - 90°

13. Instruction and Practice: Communications Task using the UHF radio set.

14. Testing: Straight and Level Flight [(Note: Rough Air may occur at any time with the communications task)].
    Altitude - 2000 ft.
    Airspeed - 90 knots
    Heading - 90°

Student Guides

Session Two

UH-1FS Sequence of Instruction

1. Review Test - Staight and Level Flight.
   Altitude - 2000 ft.
   Airspeed - 90 knots
   Heading - 90°
   Time - 3 min.

2. Review - Attitude Indicator - Roll only.

3. Instruction and Demonstration - 180° level turn to the left.

4. Practice - 180° level turn to the left.
   Heading (Begin) - 90°
   Altitude - 2000 ft.
   Airspeed - 90 knots
   Bank Angle - 16°
   Heading (End) - 270°
   (Repeat Practice)

5. Instruction and Demonstration - 180° level turn to the right.

6. Practice 180° level turn to the right.
   Heading (Begin) - 90°
   Altitude - 2000 ft.
   Airspeed - 90 knots
   Bank Angle - 16°
   Heading (End) - 270°
   (Repeat Practice)

7. Instruction, Demonstration and Practice - Use of the Collective.

8. Instruction and Practice - Reading the Torquemeter.

9. Instruction and Practice - Reading the Vertical Speed Indicator.

10. Instruction and Demonstration - Normal Climb.

11. Practice - Normal Climb
    Altitude (Begin) - 1000 ft.
    Heading - 90°
    Airspeed - 90 knots
    Vertical Speed - 500 ft. per min. climb
    Altitude (End) - 2000 ft.
    (Repeat Practice)

12. Testing

    A. Normal Climb
       Altitude (Begin) - 1000 ft.
       Heading - 90°
       Airspeed - 90 knots
       Vertical Speed - 500 ft. per min. climb
       Altitude (End) - 2000 ft.

    B. Straight and Level Flight
       Altitude - 2000 ft.
       Airspeed - 90 knots
       Heading - 90°

    C. 180° level turn to the right
       Heading (Begin) - 90°
       Altitude - 2000 ft.
       Airspeed - 90 knots
       Bank Angle - 16°
       Heading (End) - 270°

    D. Straight and Level Flight
       Altitude - 2000 ft.
       Airspeed - 90 knots
       Heading - 270°

    E. 180° level turn to the left
       Heading (Begin) - 270°
       Altitude - 2000 ft.
       Airspeed - 90 knots
       Bank Angle - 16° left
       Heading (End) - 90°

    F. Straight and Level Flight
       Altitude - 2000 ft.
       Airspeed - 90 knots
       Heading - 90°

13. Repeat Testing Sequence.

Student Guide

Session Three

UH-1FS Sequence of Instruction

1. Review Test

   A. Normal Climb
      Altitude (Begin) - 1000 ft.
      Heading - 90°
      Airspeed - 90 knots
      Vertical Speed - 500 ft. per min. climb
      Altitude (End) - 2000 ft.

   B. Straight and Level Flight
      Altitude - 2000 ft.
      Airspeed - 90 knots
      Heading - 90°

   C. 180° level turn to the right
      Heading (Begin) - 90°
      Altitude - 2000 ft.
      Airspeed - 90 knots
      Bank Angle - 16° right
      Heading (End) - 270°

   D. Straight and Level Flight
      Altitude - 2000 ft.
      Airspeed - 90 knots
      Heading - 270°

   E. 180° level turn to the left
      Heading (Begin) - 270°
      Altitude - 2000 ft.
      Airspeed - 90 knots
      Bank Angle - 16° left
      Heading (End) - 90°

   F. Straight and Level
      Altitude - 2000 ft.
      Airspeed - 90 knots
      Heading - 90 degrees

2. Instruction and Demonstration - Normal Descent

3. Practice: Normal Descent
      Altitude (Begin) - 2000 ft.
      Heading - 90°
      Airspeed - 90 knots
      Vertical Speed - 500 ft. per minute
      Altitude (End) - 1000 ft.

      (Repeat Practice)

4. Instruction and Demonstration - Deceleration/Acceleration.

5. Practice - Deceleration/Acceleration.
   Airspeed (Begin) - 90 knots
   Altitude - 2000 ft.
   Heading - 90°
   Airspeed (End Deceleration) - 70 knots
   Airspeed (End Acceleration) - 90 knots

   (Repeat Practice)

6. Testing

   A. Normal Climb
      Altitude (Begin) - 1000 ft.
      Heading - 90°
      Airspeed - 90 knots
      Vertical Speed - 500 ft. per minute
      Altitude (End) - 2000 ft.

   B. Straight and Level Flight
      Altitude - 2000 ft.
      Airspeed - 90 knots
      Heading - 90°

   C. 180° Level Turn to the Right
      Heading (Begin) - 90°
      Altitude - 2000 ft.
      Airspeed - 90 knots
      Bank Angle - 16° right
      Heading (End) - 270°

   D. Straight and Level Flight
      Altitude - 2000 ft.
      Airspeed - 90 knots
      Heading - 270°

   E. 180° Level Turn to the Left
      Heading (Begin) - 270°
      Altitude - 2000 ft.
      Airspeed - 90 knots
      Bank Angle - 16° left
      Heading (End) - 90°

   F. Straight and Level Flight
      Altitude - 2000 ft.
      Airspeed - 90 knots
      Heading - 90°

   G. Deceleration/Acceleration
      Airspeed (Begin) - 90 knots
      Altitude - 2000 ft.
      Heading - 90°
      Airspeed (End deceleration) - 70 knots
      Airspeed (End acceleration) - 90 knots

H. Straight and Level Flight
   Altitude - 2000 ft.
   Airspeed - 90 knots
   Heading - 90°

I. Normal Descent
   Altitude (Begin) - 2000 ft.
   Airspeed - 90 knots
   Heading - 90°
   Vertical Speed - 500 ft. per minute descent
   Altitude (End) - 1000 ft.

J. Straight and Level Flight
   Altitude - 1000 ft.
   Airspeed - 90 knots
   Heading - 90°

7. Repeat Testing Sequence.

Student Guide

Session Four

UH-1FS Sequence of Instruction

1. Review Testing

   A. Normal Climb
      Altitude (Begin) - 1000 ft
      Heading - 90°
      Airspeed - 90 knots
      Vertical Speed - 500 ft. per minute climb
      Altitude (End) - 2000 ft.

   B. Straight and Level Flight
      Altitude - 2000 ft.
      Airspeed - 90 knots
      Heading - 90°

   C. 180° Level Turn to the Right
      Heading (Begin) - 90°
      Altitude - 2000 ft.
      Airspeed - 90 knots
      Bank Angle - 16°
      Heading (End) - 270°

   D. Straight and Level Flight
      Altitude - 2000 ft.
      Airspeed - 90 knots
      Heading - 270°

   E. 180° Level Turn to the Left
      Heading (Begin) - 270°
      Altitude - 2000 ft.
      Airspeed - 90 knots
      Bank Angle - 16° left
      Heading (End) - 90°

   F. Straight and Level Flight
      Altitude - 2000 ft.
      Airspeed - 90 knots
      Heading - 90°

   G. Deceleration/Acceleration
      Airspeed (Begin) - 90 knots
      Altitude - 2000 ft.
      Heading - 90°
      Airspeed (End Deceleration) - 70 knots
      Airspeed (End Acceleration) - 90 knots

   H. Straight and Level Flight
      Altitude - 2000 ft.
      Airspeed - 90 knots
      Heading - 90°

I. Normal Descent
Altitude (Begin) - 2000 ft.
Airspeed - 90 knots
Heading - 90 degrees
Vertical Speed - 500 ft. per minute descent
Altitude (End) - 1000 ft.

J. Straight and Level Flight
Altitude - 1000 ft.
Airspeed - 90 knots
Heading - 90°

2. Instructions and Demonstration - Climbing Turns.

3. Practice 180° Climbing Turn to the Right.
Altitude (Begin) - 1000 ft.
Heading (Begin) - 90°
Airspeed - 90 knots
Vertical Speed - 500 ft. per minute climb
Bank Angle - 16° right
Altitude (End) - 1500 ft.
Heading (End) - 270°

4. Practice 180° Climbing Turn to the Left.
Altitude (Begin) - 1000 ft.
Heading (Begin) - 90°
Airspeed - 90 knots
Vertical Speed - 500 ft. per minute climb
Bank Angle - 16° left
Altitude (End) - 1500 ft.
Heading (End) - 270°

5. Instruction and Demonstration - Descending Turns.

6. Practice - 180° Descending Turn to the Left.
Altitude (Begin) - 1500 ft.
Heading (Begin) - 90°
Airspeed - 90 knots
Vertical Speed - 500 ft. per minute descent
Bank Angle - 16° left
Altitude (End) - 1000 ft.
Heading (End) - 270°

7. Practice 180° Descending Turn to the Right.

Altitude (Begin) - 1500 ft.
Heading (Begin) - 90°
Airspeed - 90 knots
Vertical Speed - 500 ft. per minute descent
Bank Angle - 16°
Altitude (End) - 1000 ft.
Heading (End) - 270°

8. Testing

A. Normal Climb
Altitude (Begin) - 1000 ft.
Heading - 90°
Airspeed - 90 knots
Vertical Speed - 500 ft. per minute
Altitude (End) - 2000 ft.

B. Straight and Level Flight
Altitude - 2000 ft.
Airspeed - 90 knots
Heading - 90°

C. 180° Level Turn to the Right
Heading (Begin) - 90°
Altitude - 2000 ft.
Airspeed - 90 knots
Bank Angle - 16° right
Heading (End) - 270°

D. Straight and Level Flight
Altitude - 2000 ft.
Airspeed - 90 knots
Heading - 270°

E. 180° Level Turn to the Left
Heading (Begin) - 270°
Altitude - 2000 ft.
Airspeed - 90 knots
Bank Angle - 16° left
Heading (End) - 90°

F. Straight and Level Flight
Altitude - 2000 ft.
Airspeed - 90 knots
Heading - 90°

G. Deceleration/Acceleration
Airspeed (Begin) - 90 knots
Altitude - 2000 ft.
Heading - 90°
Airspeed (End Deceleration) - 70 knots
Airspeed (End Acceleration) - 90 knots

H. Straight and Level Flight
Altitude - 2000 ft.
Airspeed - 90 knots
Heading - 90°

I. Normal Descent
Altitude (Begin) - 2000 ft.
Airspeed - 90 knots
Heading - 90°
Vertical Speed - 500 ft. per minute descent
Altitude (End) - 1000 ft.

J. Straight and Level Flight
   Altitude - 1000 ft.
   Airspeed - 90 knots
   Heading - 90°

K. 180° Climbing Turn to the Left
   Altitude (Begin) - 1000 ft.
   Heading (Begin) - 90°
   Airspeed - 90 knots
   Vertical Speed - 500 ft. per minute climb
   Bank Angle - 16° left
   Altitude (End) - 1500 ft.
   Heading (End) - 270°

L. Straight and Level Flight
   Altitude - 1500 ft.
   Airspeed - 90 knots
   Heading - 270°

M. 180° Descending Turn to the Right
   Altitude (Begin) - 1500 ft.
   Heading (Begin) - 270°
   Airspeed - 90 knots
   Vertical Speed - 500 ft. per minute descent
   Bank Angle - 16° right
   Altitude (End) - 1000 ft.
   Heading (End) - 90°

N. Straight and Level Flight
   Altitude - 1000 ft.
   Airspeed - 90 knots
   Heading - 90°

9. Repeat Testing Sequence.

Student Guide

Session Five

UH-IFS Sequence of Instruction

1. Review Test

   A. 180° Climbing Turn to the Right
      Altitude (Begin) - 1000 ft.
      Heading (Begin) - 90°
      Airspeed - 90 knots
      Vertical Speed - 500 ft. per minute climb
      Bank Angle - 16°
      Altitude (End) - 1500 ft.
      Heading (End) - 270°

   B. 180° Descending Turn to the Left
      Altitude (Begin) - 1500 ft.
      Heading (Begin) - 90°
      Airspeed - 90 knots
      Vertical Speed - 500 ft. per minute descent
      Bank Angle - 16° left
      Altitude (End) - 1000 ft.
      Heading (End) - 270°

2. Instruction - VOR Tracking

3. Practice - VOR Tracking
   Airspeed - 70 Knots
   Altitude - 1000 ft.
   Course - 90° (West of the station)

   (Repeat Practice)

4. Testing

   A. VOR Tracking
      Altitude - 1000 ft.
      Airspeed - 70 knots
      Course - 90° (West of the station)

   B. Acceleration
      Airspeed (Begin) - 70 knots
      Altitude - 1000 ft.
      Heading - 90°
      Airspeed (End) - 90 knots

   C. Straight and Level Flight
      Altitude - 1000 ft.
      Airspeed - 90 knots
      Heading - 90°

D. Normal Climb
Altitude (Begin) - 1000 ft.
Airspeed - 90 knots
Heading - 90°
Vertical Speed - 500 ft. per minute climb
Altitude (End) - 2000 ft.

E. Straight and Level Flight
Altitude - 2000 ft.
Airspeed - 90 knots
Heading - 90°

F. 180° Level Turn to the Right
Heading (Begin) - 90°
Altitude - 2000 ft.
Airspeed - 90 knots
Bank Angle - 16° right
Heading (End) - 270°

G. Straight and Level Flight
Altitude - 2000 ft.
Airspeed - 90 knots
Heading - 270°

H. 180° Level Turn to the Left
Heading (Begin) - 270°
Altitude - 2000 ft.
Airspeed - 90 knots
Bank Angle - 16° left
Heading (End) - 90°

I. Straight and Level Flight
Altitude - 2000 ft.
Airspeed - 90 knots
Heading - 90°

J. Normal Descent
Altitude (Begin) - 2000 ft.
Airspeed - 90 knots
Heading - 90°
Vertical Speed - 500 ft. per minute descent
Altitude (End) - 1000 ft.

K. Straight and Level Flight
Altitude - 1000 ft.
Airspeed - 90 knots
Heading - 90°

L. 180° Climbing Turn to the Left
Altitude (Begin) - 1000 ft.
Heading (Begin) - 90°
Airspeed - 90 knots
Vertical Speed - 500 ft. per minute climb
Bank Angle - 16° left
Altitude (End) - 1500 ft.
Heading (End) - 270°

M. Straight and Level Flight
Altitude - 1500 ft.
Heading - 270°
Airspeed - 90 knots

N. 180° Descending Turn to the Right
Altitude (Begin) - 1500 ft.
Heading (Begin) - 270°
Airspeed - 90 knots
Vertical Speed - 500 ft. per minute descent
Bank Angle - 16° left
Altitude (End) - 1000 ft.
Heading (End) - 90°

O. Straight and Level Flight
Altitude - 1000 ft.
Airspeed - 90 knots
Heading - 90°

5. Repeat Testing Sequence.

6. Repeat Testing Sequence.

PASS STUDENT GUIDE SUPPLEMENT

SESSION ONE

This student guide is provided to help familiarize you with UH-1 Flight Simulator procedures. Please study the diagrams and directions carefully. Note however, that the console operator will be available to assist you and answer any non-instructional related questions.

I. ENTERING THE COCKPIT

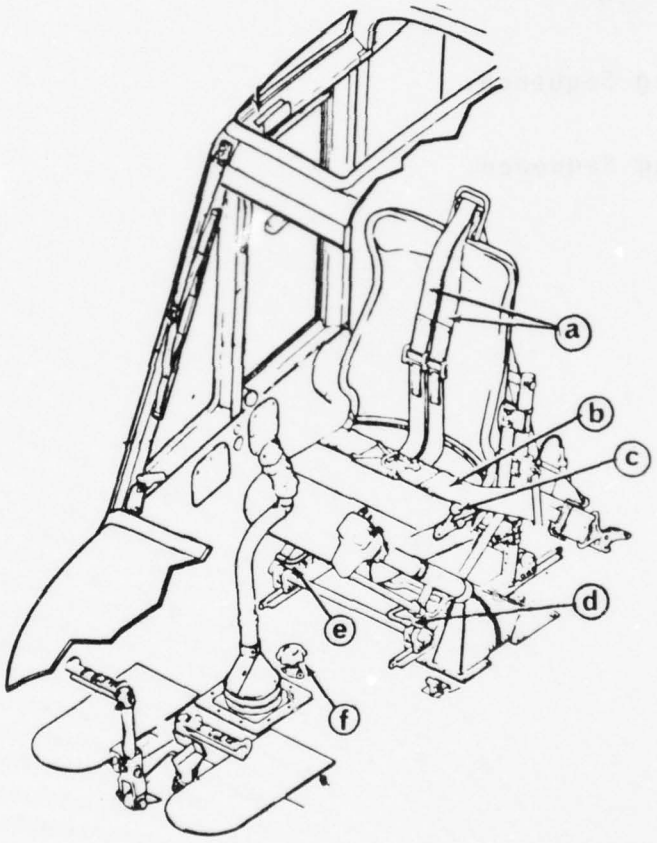


FIGURE 1 UH-IFS COCKPIT

a. Shoulder Harness
b. Seat Belt
c. Shoulder Harness Lock-Unlock Control
d. Fore and aft seat adjustment
e. Vertical Seat Height Adjustment
f. Anti-torque Pedal Adjustment Control

1. Enter the cockpit from the right and sit in the right hand seat.

2. Adjust the seat for height and leg length by using the fore and aft seat adjustment control (lever d in Figure 1) for leg length and the vertical seat adjustment control (lever e) for seat height. Adjust the seat for leg length so that you can rest your right forearm on your right thigh and knee and, at the same time, grasp the cyclic in your right hand. Adjust the seat height so that you can comfortably grasp the collective with your left hand without leaning or bending to the left.

3. Adjust the anti-torque pedal distance by using the adjustment control (knob f).

4. Fasten your seat belt and shoulder harness.

5. Put on your headphones. Position the microphone on the headset several inches away from your mouth. Plug the headset into the headphone jack that is hanging from a cord behind your seat.

II UH-1 FS COMMUNICATIONS

On the lower right hand side of the pedestal next to your seat is a signal distribution panel that looks like the one shown in the figure below.

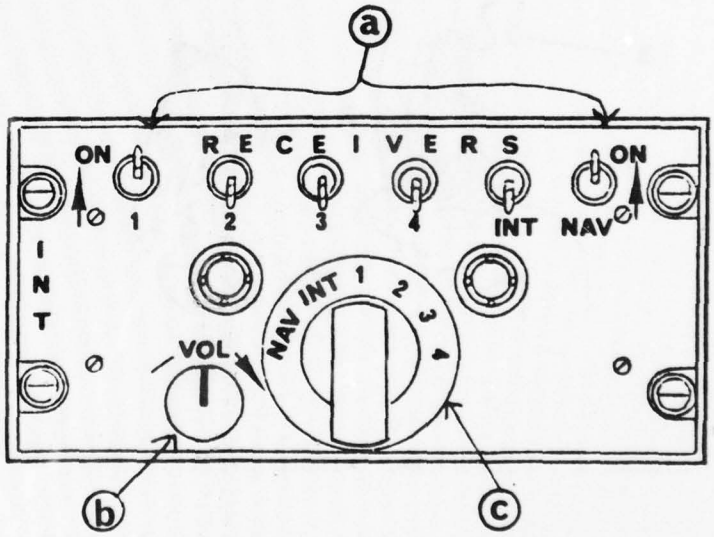


FIGURE 2 SIGNAL DISTRIBUTION PANEL

a. Receiver Switches
b. Volume Control
c. Transmit Selector Switch

The signal distribution panel is the UH-1FS intercommunication and radio control system. The Receiver switches marked 1, 2, 3, 4, INT and NAV are used for connecting or disconnecting audio to the headset. For PASS training, all receiver switches should be in the UP or ON position.

The Volume Control adjusts the earphone volume of all radio receivers. For the PASS program, you should use this control to adjust the volume of the audio instruction tapes.

The Transmit Selector switch connects the transmitter to the headset for voice communication. To communicate with the console operator, turn the transmit selector switch so that the "2" is in the top or 12 o'clock position.

In order to communicate with the console operator, you will have to depress the trigger switch on the cyclic grip. Refer to Figure 3 for the location of this switch on the cyclic.

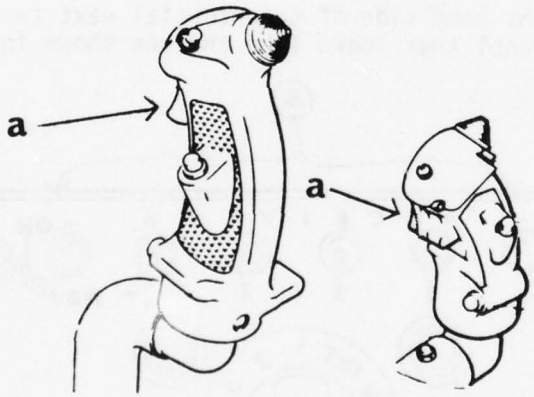


FIGURE 3 MICROPHONE TRIGGER SWITCH

It is the trigger switch that energizes the microphone on your headset. The trigger switch has two depressed positions. The first depression permits in-cockpit communication. The second depression permits out-of-cockpit communications to occur. To communicate with the console operator, you will need to depress the trigger switch to the second position.

Communication with the console operator should be limited to the following areas:

1. Asking for permission to go up on motion.

If you have been directed to fly the UH-1 flight simulator under motion conditions, you should notify the console operator when you are ready to begin. The console operator will then ensure that there is no one under or near the simulator platform when you begin your training session.

2. Notifying the console operator that you are ready for the next sequence of activities or that you have completed that day's training session.

At various times during PASS training you will be instructed via the audio tape to contact the console operator for advancement to the next stage of training. For example, you have completed the training portion of Session Two and you are ready for Session Two's Testing. You will be told to contact the Console Operator who will then advance you to Session Two's Testing. At other times you will be advanced to new training materials, or given further instructions by the console operator.

3. Notifying the console operator of equipment problems or malfunctions.

If you are having equipment problems, or even only suspect that the equipment is not operating properly, contact the console operator immediately. Two problems that you will probably encounter at least once during PASS training are: failures to reset to initial conditions and incorrect sequence of audio instruction. After every maneuver, the computer will stop the simulator and set the conditions for the next maneuver. You will be told whenever this is to happen. If, however, the set-up time is excessive, that is, 2-3 minutes or more, contact the Console Operator. Additionally, you may not be where you are supposed to be in the audio instruction. Check your student guide for the sequence of instruction for that session and if it does not coincide with what you are hearing, inform the console operator. If, for some reason, you are lost and cannot determine where you are in the sequence of instruction, ask the console operator for assistance.

The Console Operator may not answer any questions regarding how to move the controls, how to read the instruments on how to fly any of the flight maneuvers.

III AUTO TRAINING PROCEDURES

On the lower left hand side of the pedestal next to the pilot's seat in the UH-1 Flight Simulator is the automatic training control panel that is labelled, "AUTO PROG CONTROL". (See Figure 4).

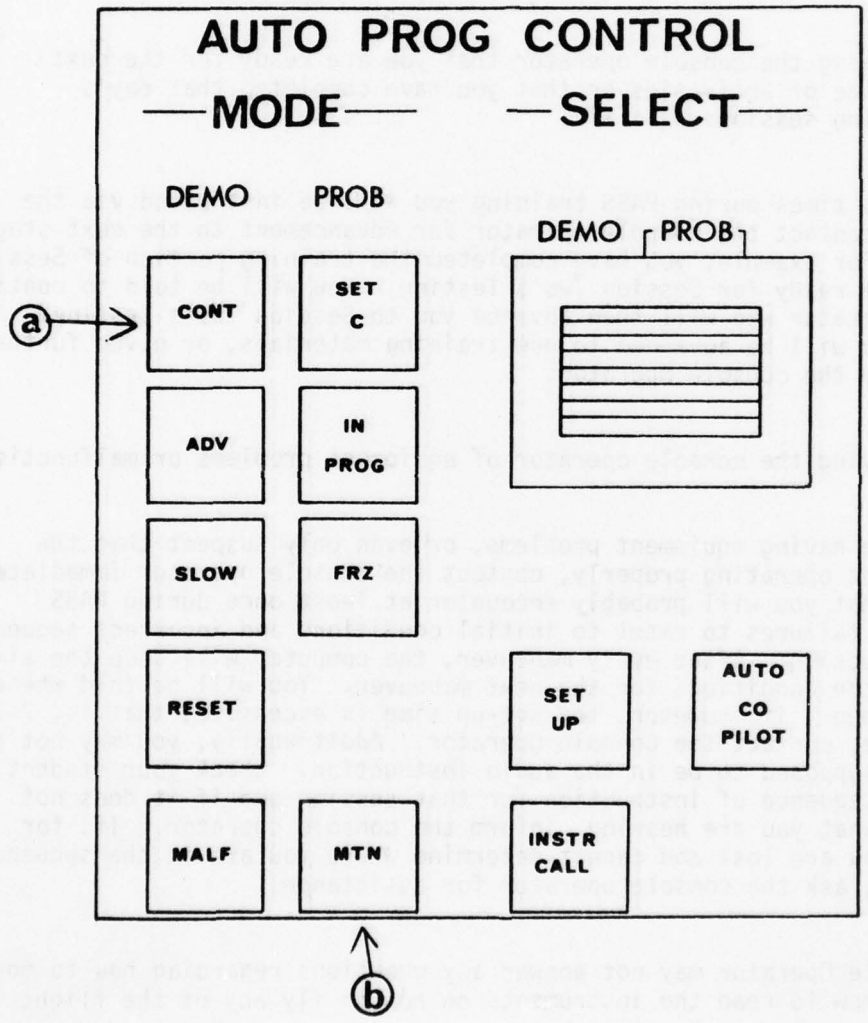


FIGURE 4 AUTOMATIC TRAINING PANEL

The automatic training control panel is used to present programmed instructional materials to the student pilot. In the PASS training program, however, you will only be concerned with two buttons, the MTN button and the CONT button. The MTN button which is in the second column is used to put the flight simulator up on motion. If you have been directed to fly on motion, you will first ask permission for clearance (refer to above communications system) and upon approval by the Console Operator, push the MTN button. The CONT or continue button is the top button in the first column. It is used to advance the instructional program to the next training segment. This button is operative only when illuminated and you will be told via the audio tape when to push it. You are not to touch or push any of the other buttons or thumbdials on the Auto. Prog. panel during PASS training.

IV COMMUNICATIONS SIDE TASK

During some of the flight maneuvers, you will be asked to do an additional communications task using the UHF radio set. The UHF radio set is located on the left hand side of the pedestal, two panels above the automatic training control panel. (See Figure 5).

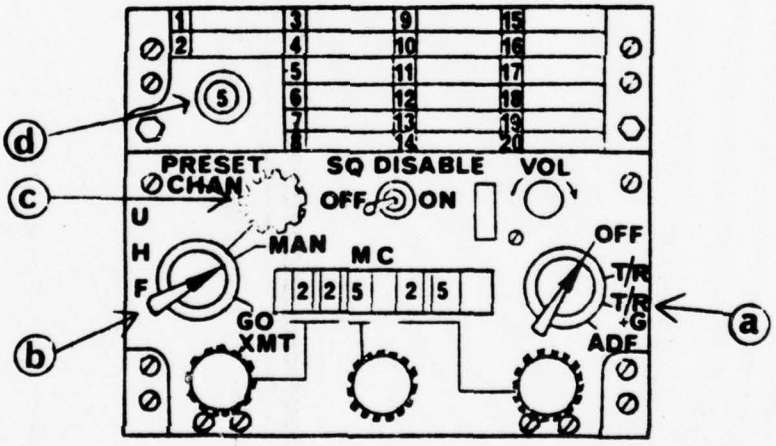


FIGURE 5

a. Function, Select Switch
b. Mode Selector
c. Preset Channel Control
d. Preset Channel Indicator

You will be using only the four switches and indicators pointed out in Figure 5.

For PASS training, the function select switch on the right hand side of the radio set should be pointing to the T/R & G position. The mode selector on the left hand side should be pointing to the preset channel position, which is the top position on the dial. You will use the preset channel control knob to dial in a designated channel and the channel number will be displayed in the window of the preset channel indicator. The audio tape will describe this additional communications task during the first session's instruction.

APPENDIX G

*PASS SOFTWARE MATH FLOW CHARTS

*SOFTWARE PROGRAM LISTING

MDAC MEMO, "CONCURRENT TRAINING AND SELECTION"
DATED 8 APRIL 1977

TABLE 3-1, AUTO TRAINING PROFILER DEVELOPMENT

TABLE 3-2, LOGICAL RECORD

*IN PROCESS
Documents will be delivered under separate cover
to ARI Field Unit, Ft. Rucker, Alabama

PASS SOFTWARE MATH FLOW CHARTS

PASS SOFTWARE PROGRAM LISTING

8 April 1977

Dr. Brian Shipley, Jr.
U.S. Army Research Institute Field Unit
Ft. Rucker, AL 36362

Dear Brian:

In accordance with our conversation on 5 April 1977, the requested information is provided which indicates the difficulties that would be experienced in operating the SFTS in both training and selection configurations simultaneously. As noted, the impact upon the program is primarily in the area of software development and debugging.

If any additional information or assistance is needed, please give us a call. See you the 19th of April.

Sincerely,

R. L. Vidmar

RLV:gw

DISCUSSION ON THE DRAWBACKS OF CONCURRENT USE OF STFS DEVICE FOR BOTH TRAINING AND PILOT SELECTION.

- The structure of the Honeywell 516 does not allow direct addressing to all of memory, but to only the base sector and to the present sector in which the computer is executing. This sector configuration forces extensive use of time and core consuming indirect addressing in order to vector within a modular developed program. This concept demands the expenditure of a large amount of effort in rearrangement and consequent debugging of the present modular STFS software system if modules are to be placed back to back in order to utilize continuous spare core.

- If it is desirable to keep all present capabilities of training with concurrent pilot selection on one device, it will be necessary to limit APAMS development to its original concept. Any changes (even if minor) to the basic syllabus will have to be monitored for impact upon software. It will be next to impossible to develop a system with any flexability when using spare time and core estimates based upon generalizations received long ago. Trade off studies (with manpower expense) will take place each time a new idea is introduced into system development.

- It will be necessary to limit Votrax messages in both number and content. Additionally, this may seriously interfere with the development of the side task as presently configured.

- Several modules such as "selection" performance measurement will need to be duplicated.

- Future development on devices other than 1-4, with different computer load configureations will be more difficult.

- It is possible that modular development of program will be sacrificed in order to conserve core that is normally used for module interaction.

- Data collection amount and rate may be limited because a limited buffer size will affect data transmission.

- With or without concurrent usage:

  a. Votrax installation will not allow both Votrax and original tape feedback messages.

  b. Cross talk in audio comm. system must never take place in cockpit runing for pilot selection.

- Under our present proposed development the cockpits on a device not associated with pilot selection will not be placed out of commission. Only modules not used in pilot selection program will be removed to conserve time and core. Removal examples are malfunction insertion, procedure indication measurement, and quality control data collection. The ability to fly NAV training, check rides, etc. will still remain.

TABLE 3-1

AUTO TRAINING PROFILER DEVELOPMENT

WP 1	127436	OCT	A/P MODE
WP 2	000000	OCT	NAV MODE
WP 3	-36.347	N.M	INIT LOC N
WP 4	16.847	N.M	INIT LOC E
WP 5	0	DEG	PITCH
WP 6	2.484	DFS	P/R LIM
WP 7	0	DEG	ROLL
WP 8	4.968	DPS	R/R LIM
WP 9	0	PSI	TQ PRESS CHNG
WP 10	0	DEG	YAW
WP 11	4.968	DPS	Y/R LIM
WP 12	89.856	KTS	IAS
WP 13	0.918	BAR	ACCEL LIM
WP 14	3000	FT.	ALTD
WP 15	499.587	FPM	CLIMB RATE
WP 16	270	DEG	TRUE HEADING
WP 17	131	NO.	EL/ PHASE/TASK
WP 18	100.000	MHZ	VHF FREQ
WP 19	0	KHZ	ADF FREQ
WP 20	0	DEG	MAG CRS TRK
WP 21	400	FT.	MIN ALTD
WP 22	0	N.M	STA LOC N
WP 23	0	N.M	STA LOC E
WP 24	0	N.M	EXIT LOC N
WP 25	0	N.M	EXIT LOC E
WP 26	7163	LBS	GROSS WT
WP 27	1430	LBS	FUEL WT
WP 28	141	IM.	CENTER OF G
WP 29	59	DEG	OAT
WP 30	29.919	IN.	BARO PRESS
WP 31	0	NO.	INITIAL WIND DIR.
WP 32	0	NO.	INITIAL WIND VEL.
WP 33	0	NO.	TURB LBL
WP 34	0	NO.	MSG NO.
WP 35	0	NO.	CROWN OUTPUT COMMANDS
WP 36	100002	OCT	END MODE
WP 37	-30	SEC	END TIME
WP 38	0	NO.	RESET SEG NO.
WP 39	0	OCT	VORTAX AUDIO MESSAGE TYPES
WP 40	0	NO.	MANEUVER NO.
WP 41	0	NO.	TEST RECYCLE NUMBER
WP 42	0	NO.	SEGMENT ID.
WP 43	0	NO.	STATIC LVL
WP 44	0	NO.	SOUND LBL
WP 45	0	NO.	APU
WP 46	0	NO.	SIDE TASK MESSAGES
WP 47	0	NO.	PRACTICE MANEUVER TIME
WP 48	0	NO.	SPARE
WP 49	100400	NO.	DISPLAY MODE
WP 50	1	NO.	DISPLAY CODE

PERIOD: 1 SEGMENT: 000

TABLE 3-1 (Continued)

AUTO TRAINING PROFILER DEVELOPMENT

Instruction for Format

Critical Terms: Segment - A segment is made of fifty sixteen bit words which are stored on disc. A segment is required whenever a change in aircraft condition or flight profile is desired, during problem formulation, only a few specific words require modification once the initial condition segment has been established. The following description of the 50-word segment will assure the operator a reference for problem construction. Note: Not all words are identical type. Some words are packed (i.e., composed of discrete packed bits of boolean logic or packed variables, status of boolean logic is 1=True, 0=False) while most are arithmetic variables.

The profiler lists each segment word by a line number, the word value is output followed by units and a descriptor, all packed words are output in octal (OCT) units, in update mode, the word may be unpacked. Each bit within a boolean packed word is output by a bit number, which is prefaced with a "B," the status of the boolean is indicated by "set" for logical status of true and by "not" for logical negation, each boolean bit also has a descriptor printed. Each line and its intended use are described in the following description:

Line 01 OCT A/P MODE

Contains 16 discrete commands which establish flight performance required of the pilot/or the computer programmed autopilot for demo or performance evaluation.

B101 ENG RUN

Set = Engine is On
NOT = Engine is Off

B102 SLO TIME

Set = Run aerodynamics at half speed (e.g., an indicated standard rate turn will change heading at 1.5 dps instead of 3 dps).

NOT = Run aerodynamics in real time.

B103 INITIALIZE

Set = Computer will initialize to conditions contained on line 1 thru 37. Word 36 must have B301 set (end condition).

NOT = Computer will not initialize this segment.

TABLE 3-1 (Continued)

B104 AUTO ROTATE

Set = Set an auto rotate mode for autopilot in inflight engine restart period. Must be set for demonstration of an auto rotation.

NOT = No set of auto rotate mode for autopilot.

B105 OP PEDALS

Set = The computer will operate pedals in cockpit.
NOT = The pilot must operate lateral cyclic.

B106 OP LATERAL

Set = The computer will operate Lat cyclic in cockpit.
NOT = The pilot must operate lateral cyclic.

B107 OP LONGITUDINAL

Set = Computer will operate longitude cyclic control.
NOT = Pilot must operate longitudinal cyclic in cockpit.

B108 OP COLLECTIVE

Set = Computer will operate collective in cockpit.
NOT = Pilot must operate collective stick.

B109 FLY PITCH NOT IAS

Set = Computer will command a specific pitch attitude.
NOTE: When set B113 must not.
NOT = Computer will not command a specific pitch attitude.
NOTE: When not set B115 must be set.

B111 FLY POWER NOT ALTD

Set = The computer will command a specific torque press.
NOTE: When set B114 must not be.
NOT = The computer will not specify a torque press.

B112 FLY YAW

Set = The computer will command a specific Yaw Angle Attitude, (e.g., Ball).
NOT = The computer will not command a specific trim.

B113 FLY IAS NOT PITCH

Set = Computer will command a specific airspeed.
NOTE: When set B109 must not be.
NOT = Computer will not command airspeed.
NOTE: When not set B109 must be set.

TABLE 3-1 (Continued)

B114 FLY ALTD NOT POWER

Set = Computer will command a specific altitude.
NOTE: When set B111 must not be.
NOT = Computer will not command altitude.
NOTE: When not set B109 must be set.

B115 FLY HEADING NOT ROLL

Set = Computer will command a specific true heading as defined on line 16 or as computed by Nav Computations when Nav Mode. Discretes are set.
NOTE: When set B110 must not be.
NOT = Computer will not command heading.
NOTE: If not set B110 must be set.

B116 MAKE LEFT TURN

Set = Turn left to achieve heading command.
NOT = Turn right to achieve heading command.

Line 02 OCT NAV MODE

Contains 16 discretes, three of which are spare, six establish navigation operations required of pilot or autopilot, five establish autotraining control functions, and one defines how turns are to be performed.

B201 TURN STD RATE

Set = Make turns at 3 dps.
NOT = Make turns at 1.5 dps.

B202 HOME TO LOCATION

Set = Commands pilot or autopilot to fly to station location specified on lines 22 and 23.
NOT = Does not perform the set function.

B203 PRACTICE

Set = Subject is in practice session.
NOT = Subject not i.e. test or demonstration.

B204 NAV INTERCEPT

Set = Intercept track specified line 20 to or from station specified in B206 using radio nav facility specified in B207, B208, B209. When on track set B205 and reset B204. When B207, B208 or B209 are set the station location coordinates must be input on line 22 and line 23. These coordinates may be found in the RAD/NAV facility second order sublist.
NOT = Does not perform set function.
NOTE: B204 and B205 are mutually exclusive.

TABLE 3-1 (Continued)

B205 NAV TRACK

Set = Track Mag course specified line 20 to or from station specified on B206.
NOT = Does not perform function specified.

B206 TO OR FRONT COURSE

Set = Nav to or front course specified by B204, B205, and line 20.
NOT = Nav from or back course (ILS) specified by B204, B205 and line 22.

B207 FLY VOR

Set = Use VOR radio facility.
NOTE: B207, B208, B209 are mutually exclusive.
NOT = Do not use VOR radio facility.

B208 FLY ADF

Set = Use ADF radio facility.
NOTE: B207.
NOT = Do not use ADF radio facility.

B209 FLY ILS LOCALIZER

Set - Use ILS facility (localizer).
NOTE: B207.
NOT = Do not use ILS (localizer).

B210 FLY ILS GLIDE SLOPE

Set = Use G/S facility, insert upon reaching outer marker in profile.
NOT = Do not fly down the glide slope.

B211 TRANSITION

Set = Subject is in transition segment of maneuver.
NOT = Subject is in steady state segment of maneuver.

B212 SPARE

B213 TASK START

Set = The initiation of this segment will mark the start of a new maneuver or task upon which performance measurements will be accumulated.
NOT = This segment is not the beginning of a task or maneuver.

TABLE 3-1 (Continued)

B214 TASK START

Set = Conclusion of this segment will mark the end of a maneuver or task for which performance measurement data has been accumulated.
NOT = This segment is not the end of a task or maneuver.

B215 DESCENT

Set = Subject should be in a descent maneuver.
NOT = Subject should not be in a descent maneuver.

B216 SKIP NEXT INITIALIZE

Set = The computer will ignore the initialization (B103) command in the next segment and the pilot or autopilot will fly thru.
NOT = If next segment has an initialization command set (B103) it will be executed.

Line 03 N.M. INIT LOC IN

Provides a location north or south of the game area center to which the 2B24 cockpit will be placed when B103 is set. NOTE: Zero is located on a line of position (LOP) which passes 31N53' 24" latitude.

Line 04 N.M. INIT LOC E

Provides a location east or west of the game area center to which 2B24 cockpit will be placed when B103 is set. NOTE: Zero is located on a LOP which passes 85W 45' 36" longitude.

Line 05 DEG PITCH

Provides specification for pitch angle attitude when B109 is set, minus indicates nose down.

Line 06 DPS P/R LIM

Provides specification for maximum pitch rate of change. The value is always input positive, usually 2.5 DPS is used for demo purposes.

Line 07 DEG ROLL

Specifies bank angular attitude when B110 is set minus indicates bank left side down.

Line 08 DPS R/R LIM

Specifies maximum roll rate of change, the value is always input positive, 5 DPS is used for demo.

TABLE 3-1 (Continued)

Line 09 PSI TQ PRESS CHANGE

Specifies the change of torque pressure required to achieve a final torque pressure setting when B111 is set.

Line 10 DEG YAW

Specifies the YAW (trim) required when B112 is set. Zero is used for trimmed flight. Minus indicates left.

Line 11 DPS Y/R LIM

Specifies the maximum rate of change of yaw, the value is always positive, 5 DPS is used for demo.

Line 12 KTS IAS

Specifies the airspeed required when B113 is set.

Line 13 BAR ACCEL LIM

Specifies the maximum pitch attitude limit required to achieve IAS specified line 12. This sign is always positive. Note 1 Bar is 2.5, usually a & 1 or 2 bar attitude is specified in demo.

Line 14 FT, ALTD

Specifies the altitude when B114 is set.

Line 15 FPM CLIMB RATE

Specifies the vertical velocity required to achieve line 14. The value is always positive.

Line 16 DEG TRUE HEADING

Specifies the true heading when B115 is set. NOTE: To achieve mag heading add local MAG VAR.

Line 17 NO EL/PHASE/TASK

Specifies descriptive data used by control program for scoring and performance evaluation. First digit is element (0-9); 2nd digit is phase (0-9); 3rd digit is task (0-9). An element is defined as being a single training concept. A task is a given procedure or maneuver to be performed. There may be up to nine tasks per element.

TABLE 3-1 (Continued)

DIGIT	PHASE
0	Period Briefing
1	Demo Briefing
2	Demonstration
3	Practice
4	Spare
5	Spare
6	Test
7	Session End

Line 18 MHZ VHF FREQ

Specifies VHF NAV Frequency required for ILS/VOR approach.

Line 19 KHZ ADF FREQ

Specifies LF ADF turning required for ADF approach.

Line 20 DEG MAG CRS TRK

Specifies the magnetic course when B204, B205, or B206 is set.

Line 21 FT, MIN ALTD

Specifies the minimum enroute altitude during airway navigation and missed approach altitude on approach.

Line 22 N.M. STATION LOCATION

Specifies north-south location relative to center of game area (CC Map) center, the radio facility is located when B207, B208, B209 or B210 is set.

Line 23 N.M. STA LOC E

Specifies the east-west location of radio facility relative to game area (CC Map) center, the facility is located when B207, B208, B209 or B210 is set.

Line 24 N.M. EXIT LOC N

Specifies the north-south LOP relative to game area center that the segment ends when B303 is set or to which navigation is required when B207 is set.

TABLE 3-1 (Continued)

Line 25 N.M. EXIT LOC E

Specifies the east-west LOP relative to game center that the segment ends specified when B303 is set or to which navigation is required when B202 is set.

Line 26 LBS GROSS WT

Sets the gross weight of the A/C during initialization.

Line 27 LBS FUEL WT

Sets the fuel weight of the A/C during initialization.

Line 28 IN, CENTER OF G

Sets the A/C center of gravity during initialization. NOTE: A standard C of G = 141.3 inches is used in autotraining.

Line 29 DEG OAT

Specifies field temperature in degrees farenheit.

Line 30 IN BARO PRESS

Specifies field barometric press used for altimeter correction.

Line 31 DEG WIND FROM

Specifies wind direction.

Line 32 KTS WIND SPEED

Specifies wind velocity.

Line 33 NO, TURB LVL

Specifies local environment turbulence (0-9).

Line 34 NO. MSG NO.

Specifies demo message number to be output. This is a sequential number, each initialize segment requires incrementing this number. This first tape message number is zero, maximum number is 127.

TABLE 3-1 (Continued)

Line 35 SPARE

Line 36 OCT END MODE

Contains sixteen discretes, thirteen of which specify segment end conditions, if none are set, the segment will end when in air. Usually only one end condition is specified per segment. The end condition sets a flag only, the segment may be extended due to transmission of an audio message by the demo message system or when line 37 is specified as some negative quantity greater than 1 second, the remaining three discretes are used for autotraining control. The unpack of this word in update allows inspection and update bit by bit.

B301 END OF INITIALIZE

Set = End when initialization message has been output.
NOT = End of something else.

B302 SPARE

B303 END ON POSITION

Set = When at location specified line 24 and 25.
NOT = End of something else.

B304 END ON ROLL AND VERTICAL VELOCITY

Set = End when roll specified line 7 and vertical velocity specified line 15.
NOT = End on something else.

B305 END ON HEADING

Set = End on true heading specified line 26.
NOT = End on something else.

B306 END ON ALTITUDE

Set = End when altitude as specified line 14.
NOT = End on something else.

B307 END ON YAW

Set = End when Yaw as specified line 10.
NOT = End on something else.

TABLE 3-1 (Continued)

B308 END ON IAS

Set = End when speed as specified line 12.
NOT = End on something else.

B309 END ON ROLL

Set = End when bank as specified line 7.
NOT = End on something else.

B310 END ON PITCH

Set = End when pitch as specified line 5.
NOT = End on something else.

B311 END ON TORQUE PRESS

Set = End when Torque Pressure as specified line 9 modified.
NOT = End on something else.

B312 END ON RATE OF CLIMBING (ROC)

Set = End when RCC as specified line 15.
NOT = End on something else.

B313 END ON HEADING OR ALTITUDE

Set = End when Heading specified line 26 or Altitude specified line 14.
NOT = End on something else.

B314 PRACTICE/TEST RECYCLE

Set = Recycle to last initialize segment when segment ends.
NOT = No Recycle.

B315 PLAY AUDIO MESSAGE

Set = Play Demo Message when end conditions met.
NOT = Do not play message.

B316 END OF PROBLEM

Set = Trainer freeze when this segment ends. NOTE: Use in last segment of a problem.
NOT = Trainer will not freeze next segment will be active.

Line 37 SEC END TIME

Specifies the number of seconds delay after end conditions are met before the next command will be initiated when in a demonstration, but specifies maximum number of seconds in segment regardless of end conditions when in a practice or test mode. This value is always input negative.

TABLE 3-1 (Continued)

Line 38 NO RESET NO.

Specifies in initial segment number to which the problem will be reset by actuation of cockpit switch.

Line 39 ROTARY AUDIO ALERT TYPE

Specifies type of audio alerts that can be heard this segment. Each 4 bits stands for 1 type message (maximum of 4 types per segment) where starting priority is in lower 4 bits. These are active when set as follows.

0	No Message
1	Track Error Messages
2	Spare
3	Altitude Messages
4	Airspeed Messages
5	Heading Messages
6	Roll Messages
7	Spare
8	Yaw Messages
9	Vertical Velocity Messages
10	Spare
11	Spare
12	Spare
13	Spare
14	Spare
15	Spare

Line 40 NO. MANEUVER NO.

Specifies the checkride maneuver of which segment is a part. The next maneuver start requires this number to be incremented. All segments part of the same maneuver have identical numbers.

Line 41 TEST RECYCLE

Specifies number of times a test session should be recycled.

Line 42 NO. SEGMENT ID

Unique segment record number 0 to 199 first 99 of which correspond to thumb wheel selection switch numbers.

Line 43 NO. RADIO STATIC LEVEL

Number 0 to 9.

TABLE 3-1 (Continued)

Line 44 NO. SOUND LEVEL

A number 0 to 9 which sets A/C sound level intensity. A sound level of 3 is generally used in training.

Line 45 NO. APU

A number 0 or 1 which sets availability of APU on ground.

Line 46 SIDE TASK MESSAGES

Specifies if Side Task will operate (nonzero) and commands specifid channels to select. Each command is 4 bits in length. Starting priority is in lower 4 bits. These are active when set as follows.

1 = channel 3 select
2 = channel 5 select
3 = channel 7 select

Line 47 MANEUVER PRACTICE TIME

Specifies maximum number seconds subject will remain in a practice maneuver even when recycled for unacceptable conditions. This is input as a negative number.

Line 48 SPARE

Line 49 CRT DISPLAY INFORMATION

Specifies the map and scenario to be displayed upon CRTs.

Line 50 DISPLAY ID

Specifies format under which displays will be placed upon CRT screens.

TABLE 3-2

LOGICAL RECORD

BLK	SB	DT	TM/SE	SX_1	SX_2	SX_3	SX_4	SY_1	SY_2	SY_3	SY_4	$i\ PD_1$	$i\ PD_2$	$j\ PT_1$	$j\ PT_2$	$k\ RL_1$	$k\ RL_2$	AL_0	TQ/AS	HD	VS	YW	CD	SS/BR

PHYSICAL RECORD
(DISK + MAGNETIC TAPE)

$L\ REC_1$	$L\ REC_2$	$L\ REC_3$	$L\ REC_4$	$L\ REC_5$	$L\ REC_6$	$L\ REC_7$	$L\ REC_8$	$L\ REC_9$	$L\ REC_{10}$

DISK TRACK FORMAT

$P\ REC_1$	$P\ REC_2$	$P\ REC_3$	$P\ REC_4$	$P\ REC_5$	$P\ REC_6$

BLK-blank, SB-subject, DT-date, TM-time, SE-session, SX-stick X, SY-stick Y, PD-pedal, i-side task started, PT-pitch, j-segment change, RL-roll, k-reset occurred, AL-altitude, TQ-torque, AS-airspeed, HD-heading, VS-vertical speed, YW-yaw, CD-course deviation, SS-side task station selection, BR-side task button response, L REC-logical record, P REC-physical record

APPENDIX H

PASS HARDWARE RECONFIGURATION DOCUMENT

Document sent under separate cover to ARI Research Field Unit, Ft. Rucker, Alabama, on 3 January 1978. Letter of transmittal shown overleaf.

MCDONNELL DOUGLAS ASTRONAUTICS COMPANY - EAST

Saint Louis, Missouri 63166

3 January 1978
E422-78-001

Subject: Contract DAHC19-77-C-0015, Development of an Automated Pilot Aptitude Measurement System for Rotary Wing Aviators, "Contractor Submittal of PASS Reconfiguration Documentation"

To: U.S. Army Research Institute Field Unit
Attention: Dr. Brian Shipley, Jr.
Ft. Rucker, Alabama 36362

1. Ten (10) copies of the Proficiency Based Aviator Selection System (PASS) Reconfiguration Documentation are submitted herewith.

2. It should be noted that this documentation specifies the hardware changes implemented by McDonnell Douglas during the hardware implementation activity prior to the tape drive unit installation by Boudreau Consulting.

3. This documentation is an appendix to the PASS Final Report to be submitted 1 March 1978.

James G. Curtin
Program Manager - PASS
McDonnell Douglas Astronautics Company - St. Louis

JGC:gw

1 Enclosure
(1) PASS Reconfiguration Documentation (10 copies)

XC: Department of the Army
U.S. Army Research Institute for the
Behavioral and Social Sciences
Attention: Mrs. Ollie Dickens, Room 6E10
5001 Eisenhower Avenue
Alexandria, Virginia 22333

APPENDIX I

ACCEPTANCE TEST DE-BRIEFING FORMS

Comprehensive documentation representing candidate comments from the operational capability demonstration, acceptance test 23-27 Jan 1978, are retained by Dr. Brian Shipley, Jr., Contract Monitor, ARI Field Unit, Ft. Rucker, Alabama.

APPENDIX J

MEMORANDUM OF UNDERSTANDING (MOU)

AND

CONTRACT COMMENTS TO MOU DATED 5 AUGUST 1977

DISPOSITION FORM

For use of this form, see AR 340-15, the proponent agency is TAGCEN.

MDC E1839

REFERENCE OR OFFICE SYMBOL	SUBJECT
PERI-OA	Signatures for Memorandum of Understanding

TO: SEE DISTRIBUTION

FROM: ARI Field Unit

DATE: 13 Jul 77

CMT 1: Dr. Shipley/vt/6987

1. A Memorandum of Understanding (MOU) is attached for your review and signature.

2. ARI's contractor, McDonnell Douglas Astronautics, East, requires access to a UH-1 FS at USAAVNC to install a research version of a Performance-Based Aviator Selection System (PASS). Installation of PASS will involve attachment of four VOTRAX model ML-I voice synthesizer units and one Honeywell model 4150 tape drive together with necessary interface units and wiring. Attachment of these devices will be accomplished in a manner which will not interfer with the use of the device for regular training.

3. All other aspects of the PASS installations will involve software and will not affect the useability or maintainability of the device.

4. When the installation of PASS is completed by ARI's contractor, about 15 January 1978, ARI will assume its operational use to collect data needed to develop and validate improved criteria for the selection of candidates for IERW training. ARI will use PASS on a regularly scheduled basis and the objective will be minimum interference with student training.

5. Schedule of PASS installation calls for start of hardware installation between 25 July 1977 and 31 August 1977 and may require up to ten days time.

6. Request you expedite your review and sign as soon as possible to reduce possibility of delays in PASS installation schedule.

Charles A. Gainer

1 Incl
as

CHARLES A. GAINER
Chief

DISTRIBUTION:
COL Brown
COL Bray
Mr. Baza
Mr. Curtin

DA FORM 1 FEB 62 2496 REPLACES DD FORM 96, WHICH IS OBSOLETE. ☆GPO-1975-665-422/1063

MEMORANDUM OF UNDERSTANDING REGARDING THE ARI
PERFORMANCE-BASED AVIATOR SELECTION SYSTEM RESEARCH

1. PURPOSE: This Memorandum of Understanding (MOU) is intended to delineate areas of responsibility for each of the organizations involved in the research effort for development of Performance-Based Aviator Selection System (PASS) on the UH-1 FS at Ft Rucker, Alabama.

2. SCOPE: This MOU will identify organizations involved, assignment of devices, establish maintenance responsibilities, provide guidelines for access, establish support responsibilities, and define security of area.

3. ORGANIZATIONS INVOLVED: The following organizations/agencies are involved in this project:

a. Flight Simulator Division, Dept. of Academic Training, Directorate of Training, USAAVNC, has a key role in the success of this project. They shall be responsible to manage the overall support, access to the UH-1 FS, and weekly scheduling of time on UH-1 FS.

b. DIO is responsible for maintaining cognizance over the USAAVNC Maintenance Contractor and to advise all parties involved about contractual matters which would have an impact upon the project.

c. USARI, Ft Rucker Field Unit is responsible for coordination between the USAAVNC and ARI's contractor, McDonnell Douglas.

d. Singer Link shall be responsible for providing support as defined in paragraphs 4, 5, 6, 7, & 8 and as coordinated and agreed with the USAAVNC.

e. McDonnell Douglas is responsible for those factors as defined in paragraphs below and the restoration of the UH-1 FS to its original state upon completion of project.

4. ASSIGNMENT OF COCKPITS:

a. McDonnell Douglas will require a device to be assigned for the installation of the Tape Drive and the four VOTRAX systems. It is understood that device #4 has been identified. During the course of the programming and debugging McDonnell Douglas will require continuous daily access to a device of no less than 8 hours per day. There is a need to have access to the line printer and device #1. The attached schedule defines the calendar time involved and the time required for the line printer, device #1, device #4 and other devices.

b. The scheduling of time on the devices will be accomplished by the Chief, Flight Simulator Division, Ft Rucker, AL on a weekly basis each Thursday for the following week. ARI will be the point of contact for any changes or problems that arise.

c. Prior to attachment of the PASS to a device, checkout of that device will be accomplished jointly between the demonstrator and the Army to establish the precise condition of the device. The Army's established Acceptance Test Procedures (ATP) for device UH-1 FS will be used in conducting the checkout and specific performance parameters will be recorded. Upon completion of the PASS demonstration, the same procedure will be repeated and any deviations corrected. The purpose of these checkouts is to assure the demonstrator and the Army that the device is returned to its original condition at completion of the demonstration.

5. MAINTENANCE RESPONSIBILITIES:

a. Maintenance of the 2B24 is accomplished by contract. The maintenance contractor is required to provide a 90% availability rate for the device. During the period of the demonstration, the cockpits utilized by the Performance-Based Selection System (PASS) will be counted against the required availability in the same manner as if they were being utilized for training.

b. Any unscheduled 2B24 maintenance and repairs, including catastrophic failures, induced by the PASS will be accomplished by the Singer Company under the 2B24 maintenance contract. Such failures will not be counted against Singer's contractual availability requirements.

c. Any repairs required for the PASS will be the responsibility of McDonnell Douglas.

6. GUIDELINES FOR COCKPIT ACCESS:

a. Hours of operation for the UH-1 FS extends from 0600 to 2255 Monday thru Friday, except for holidays.

b. The building is open from 2300 Sunday through 2400 Friday each week.

c. McDonnell Douglas will have access to the building during the above hours. They will have access to the assigned devices for the period specified in para 4.b above. If additional access is required this may be arranged thru ARI and the Chief, Flight Simulator Division, Ft Rucker with approval by Singer if access is required between 2400 and 0500 hrs.

7. SECURITY OF AREA:

McDonnell Douglas is responsible for security of information or equipment associated with their system. To assist in this area, the Chief, Flight Simulator Division, Ft Rucker, will provide a work area and wall locker space for equipment.

8. CONSTRAINTS AND LIMITATIONS:

a. Device must be restored to original configuration in the event the final product does not meet standards of acceptance test.

b. If 90% availability of system is impaired during installation, it shall not be counted against Singer Link's maintenance contract.

c. MIL Standards must be employed in all wiring to include coding of each wire and provide full documentation of schematics.

HOWARD E. BROWN, COL
Director
Dept of Acad Tng

CHARLES A. GAINER
Chief
ARI Field Unit

GAITHER C. BRAY, COL
Director
Dir of Ind Ops

MARVIN L. BAZA
Program Manager
Singer-Link Field Maint

JAMES G. CURTIN
Program Manager
McDonnell Douglas Astronautics
Co., East

ANTICIPATED SCHEDULE OF REQUIREMENTS FOR TIME ON UH-1FS COMPUTER SYSTEM

Week	Date	Category	Device	Daily Time	Weekly Time	Comments
1		Software	1-4	8	40	any device
2		Software	1-4	8	40	any device
3		Software	#1	8	40	line printer
4		Software	#1	8	40	line printer
5		Software	#4/#1	8	40	16 hrs/week on #1 in 4-hr blocks
6		Software	#4/#1	8	40	16 hrs/week on #1 in 4-hr blocks
6		Hardware	#4	8	40	VOTRAX installation
7		Software	#4/#1	8	40	16 hrs/week on #1 in 4-hr blocks
7		Hardware	#4	8	40	Tapedrive
8		Software	#4/#1	8	40	16 hrs/week on #1 in 4-hr blocks
9		Software	#4/#1	8	40	4 hrs/week on #1
10		Software	#4/#1	8	40	4 hrs/week on #1
11		Software	#4/#1	8	40	4 hrs/week on #1
12		Software	#4/#1	8	40	4 hrs/week on #1
13		Software	#4/#1	8	40	4 hrs/week on #1
14		Software	#4	8	40	
15		Software	#4	8	40	
16		Software	#4	8	40	
17		Software	#4	8	40	

Week	Date	Category	Device	Daily Time	Weekly Time	Comments
18		Software	#4	8	40	
19		Software	#4	8	40	
20		Software	#4	8	40	
				TOTAL TIME:	880	

NOTES:

a. Minimum 4-hr blocks of time are requested when times must be split between different devices in the same day.

b. Detailed schedule of specific time requirements will be submitted to Scheduling at Flight Simulator Division on Thursdays of the preceding week.

c. Hardware installation is scheduled for weeks six and seven and will require time on two devices which means a total of 80 hrs per week.

d. Summary of time per device:

	Time
#4	636
#1	164
Other	80
TOTAL	880

e. These times are for system development only. They do not include post-development research utilization.

DISPOSITION FORM

MDC E1839

For use of this form, see AR 340-15; the proponent agency is The Adjutant General's Office.

REFERENCE OR OFFICE SYMBOL	SUBJECT
ATZQ-DI-PC	Signatures for Memorandum of Understanding

TO DIO FROM Procurement Division DATE 15 Jul 77 CMT 1
Mr. Ellis/fd/3404

1. The Memorandum of Understanding regarding the ARI performance-based aviator selection system research has been reviewed. The following comments are provided for your consideration prior to signature:

a. Para 3.b. is not clear. "USAAVNC Maintenance Contractor" should be changed to include the specific contract including contract number; contractor's name; and description of project.

b. Para 4.b. A requirement for a Tapedrive 4150 is presently being solicited. Bids are due to open 1 Aug 77. This solicitation requires a 30-day delivery after receipt of notification of award. A requirement for 3-each VOTRAX ML-I-1920 Voice Synthesizer Unit was received 6 Jul 77. The solicitation is scheduled for issuance on or around 25 Jul 77 and opening 24 Aug 77. A 30-day delivery time is minimum.

c. Para 8.c. specifies "MIL Standards must be employed in all wiring"**. Consideration should be given to including the MIL Standard number.

2. The maintenance contract specified in para 3.b. is not administered by Procurement Division. Data suggested for inclusion is not available in this office. The 2B24 - Singer Contract - is administered by AAVSCOM.

RALPH S. TOMITA
MAJ, TC
Chief, Procurement Division

1 Incl
1. DF ARI, 13 Jul 77

DA FORM 1 FEB 62 2496 REPLACES DD FORM 96, EXISTING SUPPLIES OF WHICH WILL BE ISSUED AND USED UNTIL 1 FEB 63 UNLESS SOONER EXHAUSTED.

GPO : 1966 O - 223-600

MCDONNELL DOUGLAS ASTRONAUTICS COMPANY - EAST
Saint Louis Missouri 63166

5 August 1977
E422-77-032

Subject: MDC Comments to Memorandum of Understanding (MOU), dated 13 July 1977

To: Mr. Charles A. Gainer, Chief
ARI Field Unit
Fort Rucker, Alabama 36362

References: (a) Meeting at Fort Rucker on 28 and 29 July 1977 between Dr. Brian Shipley, Jr. (ARI) and R. Bull (MDC)
(b) Telecon 28 July 1977 between Dr. Brian Shipley, Jr. (ARI) and J. Curtin (MDC)

1. MDC has signed the Memorandum of Understanding (MOU) as of 5 August 1977. The following comments are submitted to ARI:

a. Reference Paragraph 4.a - MDC has no contractual responsibility for installation or disassembly of the Honeywell Model 4150 Tape Drive Unit. This is an ARI subcontract function. Any time lost by the MDC software area due to tape drive installation should be noted.

b. Reference Paragraph 4.c - If a "joint" ATP for the device is required "prior to attachment of the PASS," the following MDC comments are rendered:

(1) ATP documentation for the UH-1 FS is to be made available to MDC software personnel.

(2) Effort required by MDC for ATP support will be scoped for schedule impact.

(3) MDC position is that the end point time limit to return the device to its original condition at completion of the demonstration" is bounded by the end of the contract.

c. Reference Paragraph 5.c - MDC position concerning repairs for items of equipment that constitute "the PASS" is that MDC has no responsibility for repair or maintenance of the Honeywell Model 4150 Tape Drive Unit (see also 1.a this memo).

d. Reference Paragraph 8.a - "Standards of acceptance test" has not been defined to MDC at this date.

5 August 1977
E422-77-032

e. Reference Paragraph 8.c - Review of the cited MIL Standards does not provide information on "full documentation of schematics." MDC position is that we will provide vendor drawing of the VOTRAX and MDC drawings of any modifications made to the training device.

Prepared by:

Richard F. Bull
Lead Engineer - Human Factors
McDonnell Douglas Astronautics Company - East

Approved by:

James G. Curtin
Program Manager
McDonnell Douglas Astronautics Company - East

RFB/JGC:rlt

APPENDIX K

MDAC MEMO, "ORDER FOR DDP-516 HONEYWELL OPTION DRAWER - MDAC LETTER DATED 24 AUGUST 1977

MCDONNELL DOUGLAS ASTRONAUTICS COMPANY - EAST
MDC E1839
Saint Louis, Missouri 63166

24 August 1977
E422-77-036

Subject: Order for DDP-516 Honeywell Option Drawer - McDonnell Douglas Astronautics Company

To: Boudreau Consulting
Pope Industrial Park
P.O. Box 304
Holliston, MA 01746

Reference: Invoice #001254 dated 7/25/77

CC: Mr. Charles A. Gainer
ARI Field Unit
P.O. Box 476
Ft. Rucker, AL 36362

1. After shipment was received from Boudreau Consulting, McDonnell Douglas personnel initiated installation of the equipment at Fort Rucker, AL on 9 August 1977.

2. During the period of installation your personnel rendered continual advice and support by telecon to Ft. Rucker. In particular your secretary, Elli, and Mr. Ron Roberge rendered significant aid during this period. The items noted below were discovered during the installation and are cited for your records:

a) The option drawer and cabling were installed into the 516 cabinet and connected to the system without any major problems. The software supplied with the drawer, used to test the Parallel Output Channels (POC's) at your plant, would not run at our site. The program would clear itself from memory. Our own simplified program verified proper POC programmed outputs, but could not do Direct Multiplex Control (DMC) data transfers.

b) The problem was traced to the existence of a CC151 and CC152 μ pac which are not necessary for a POC, but are only installed in a Parallel Input-Output Channel (PIOC). Removal of these two pacs from each POC did allow proper operation in DMC mode.

24 August 1977
E422-77-036

c) The only remaining problem is SKS01 of POC 2 does not function. Signal tracing did show that continuity from the customer end of the 50 ft. cable to B4422 does exist. Replacing the CC151 with two of the aforementioned CC151 pacs did not correct the problem.

3. It is assumed that corrective action for the discrepancy cited in 2.c will be accomplished by your organization during the Tape Drive Unit installation o/a 15 September 1977.

4. Thank you for your support.

James G. Curtin
Project Manager

JGC:nfp

APPENDIX I

(1) MODIFICATIONS TO PASS AND PASS DEVELOPMENT SCHEDULE

(2) MDAC TELECON REPORT 16 NOVEMBER 1977

(3) DATA COLLECTION FORMAT

MDC E1839

DEPARTMENT OF THE ARMY
U.S. ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES
5001 EISENHOWER AVENUE
ALEXANDRIA, VIRGINIA 22333

PERI-RC-O

23 November 1977

McDonnell Douglas Corporation
McDonnell Douglas Astronautics
Company - East
ATTN: Contracts Office
PO Box 516
St. Louis, MO 63166

SUBJECT: Contract DAHC19-77-C-0015

Gentlemen:

Attached letter, PERI-OA, dated 11 November 1977, is forwarded to your office for review and transmission to Mr. James G. Curtin, Project Manager for subject contract.

It is requested that your recommendations be furnished, in writing, directly to Fort Rucker, Mr. Brian D. Shipley, with an information copy to ARI Contracts Office, 5001 Eisenhower Avenue, Room 6E10, Alexandria, VA 22333.

Sincerely yours,

Ollie M. Dickens

OLLIE M. DICKENS
Contracting Officer

1 Incl
As stated

MDC E1839

DEPARTMENT OF THE ARMY
US ARMY RESEARCH INSTITUTE FIELD UNIT
P.O. BOX 476
FORT RUCKER, ALABAMA 36362

PERI-OA

11 November 1977

SUBJECT: Modifications to PASS and PASS Development Schedule

James G. Curtin, Project Manager
Life Sciences Division
McDonnell Douglas Astronautics Company - East
Saint Louis, Missouri 63166

1. It may be necessary to reschedule the tryout experiment from 12-16 December 77 to 9-13 January 78. MAJ White has learned that there may be fewer than 12 novices available as subjects for the presently scheduled tryout experiment because of the Christmas Holidays. USAAVNC is trying to have all casuals now at Fort Rucker in training before Christmas. USAAVNC has not been receiving any new candidates since May 77 and none will begin arriving again until 2 January 78. How would this change of tryout experiment affect your contractual deadline to submit the final report by 14 January 78?

2. BG Canedy's visit of 21-23 November 77 has been changed. GEN Starry, TRADOC CG, rescheduled his visit from 21-23 November 77 to an unspecified date in early January 78. Since the primary reason for BG Canedy's visit 21-23 November 77 was to coincide with GEN Starry's visit, we also expect BG Canedy to defer his visit. Also, the visit of COL Taylor, DDR&E, has been rescheduled for 1,2 December 77.

3. As I related in yesterday's telephone conversation, I am concerned about the projected revision of PASS. At the initial meeting in February and on several subsequent occasions I have requested that Sessions II through V begin with a short performance test. At the minimum this test should include the maneuvers from the preceeding session. Somehow, in the resequencing of activities, such tests have been omitted or placed inappropriately in the existing version of the PASS syllabus. I had understood, perhaps mistakenly, that these review tests would be incorporated in the upcoming final revision of the system. However, Ruth Marco tells me that no such changes were anticipated or intended.

4. After a review of the PASS measurement objectives with Mr. Gainer, we must insist on the inclusion of the review test feature at the start

PERI-OA 11 November 1977
SUBJECT: Modification to PASS and PASS Development Schedule

of Sessions II through V. These tests are essential to measure the applicant's capacity to retain the complex skills and knowledge required of the helicopter pilot. Suggestions for a desired sequence of Session activities is given at Inclosure 1. These suggestions also include some changes recommended on the basis of preliminary tryout experiences gained with present version of PASS. The substance of these tryout experiences are summarized in comments at Inclosures 2.

5. Ruth assures me that Session III is now useable as a demonstration item. Assuming that the precockpit instructions would also be in final or near final form by 8 December 77 (see comments at Incl 3), the date scheduled for a demonstration of PASS for COL Taylor, Mr. Gainer and I do not think it advisable to invest further special effort in having a special demonstration capability. In our opinion, we would prefer that you invest maximum effort in making the final revisions to the PASS syllabus incorporating both the review tests at the beginning of Sessions II through V and the lessons learned for the preliminary tryout experiences.

6. Inclosure 4 is your file copy of the modified Memorandum of Understanding.

Brian D. Shipley, Jr.

4 Incl
as

BRIAN D. SHIPLEY, JR.
Research Psychologist

MEMO

SUBJECT: Sequence and Substantive Content Changes for Final Revision of PASS

DATE: 11 November 1977

SESSION I

1. Drop material on VOTRAX messages and put it on cassette tapes for use in precockpit instruction. This change should add about eight minutes of additional testing or practice time.

2. Condense all review discussions in all sessions. Use only the minimum detail essential to describe task or maneuver objectives, parameters, and any required operational instructions or relationships. In Session I, this should result in about five additional minutes for testing or practice.

3. Drop the extensive review material following the VOTRAX messages entirely. With those messages out, there is no need for this review.

4. Use the time gained from the VOTRAX messages and the review to increase the amount of time in the STL practices as follows:

a. Increase the time in each STL practice from two to three minutes. Insert a third STL practice without rough air in the initial practice block.

These changes should add about 7 minutes of total STL practice, from 8 to 15 minutes.

5. The material on the RMI should include a demo and guided practice on the correction of heading errors only.

6. There should be at least two minutes of STL practice for the side task immediately following its introduction. This practice should not include rough air.

7. The Session I final test should consist of three two-minute periods of STL with rough air and side task.

8. If there is a need to reduce total time in Session I, start first by cutting each practice sessions to two minutes and follow by eliminating the second STL with side task in the practice block.

SESSION II

1. Session II should begin with a very brief review of pitch, bank, trim, and the side task. This review should include a review of STL parameters with a comment that these will be the standard parameters for STL unless instructed otherwise in subsequent tests.

2. The review should be followed immediately by three minutes of STL. This STL period should consist of 1 1/2 minutes without and then with rough air. The side task should be used throughout.

3. Instruction, demos, and practice on 180 degree right and left turns should follow this STL test. This is a departure from the present sequence but turns follow logically from the review of bank. The collective and climbs do not.

4. The instruction, etc., on the collective, torque, and climbs should follow the practice of turns.

5. The final Session II test profile should consist of at least two two-minute periods. Each period should consist of STL, a climb, and a turn with one turn in each direction. Use the sidetask and rough air.

SESSION III

1. Condense the review at the beginning of Session III and include both turn and climb information in a single review.

2. Convert the practice periods on 180 degree turns to two test periods as at the end of Session II.

3. Introduce descents with instruction, demo, and practice. Extensive instruction is not required because this is an extension of the information on climbs.

4. Introduce accelerations and decelerations as a single maneuver. Keep instructional details and demos to a minimum. These skills should be generalizations of existing skills and knowledge. Cover only the essential new information. Practice should include both elements of acceleration and deceleration in each order. This will help keep the airspeed balanced and less time will be required to regain initial conditions with the autopilot at the end of each practice session.

5. Session III should end with at least two test periods. Each period should include a climb, a descent, and a combined acceleration-deceleration maneuver.

6. If time constraints limit the amount of material to be covered in Session III, move the acceleration-deceleration maneuvers to Session IV and expand the contents of the Session III tests to include turns, rough air and side tasks. Also increase the number of test periods to three if possible.

SESSION IV

1. Session IV should begin with a review and test of a climb, descent and an acceleration-deceleration. However, if the acceleration-decelaration

has been placed in Session IV for first introduction, include two 90 degree turns one in each direction.

2. Introduce climbing and descending turns as a generalization of skills and knowledge learned in the climbs, descents, and 180 degree turns. Instruction should be at a minimum to cover any new, i.e., previously unencountered control movements or instrument readings and limit the demo to how to start and end the two maneuvers. There is no need to sit for some two minutes watching complete execution.

3. There should be four periods to practice climbing and descending turns, one for each pair of combinations.

4. Test profile for the end of Session IV is acceptable except that the review and descriptive material should be condensed.

5. It may be necessary to put climbing and descending turns in Session V. If so, expand the testing periods and maneuvers covered in the Session IV tests. Include extensions of the defined maneuvers such as turns to assigned headings, i.e., 130 degrees, and climbs and descents to other altitudes and at different vertical rates.

SESSION V

1. Start Session V with a brief review and at least one test profile, standard form, from the end of Session IV. The standard form would cover the maneuvers as instructed and practiced.

2. Introduce climbing and descending turns as required. This should be instruction, demos and guided practice as described in item 2 of Session IV above. If climbing and descending turns must be covered in Session V instead of Session IV, it may be necessary to drop VOR tracking from the syllabus entirely.

3. Introduce VOR tracking with instruction, limited demos of correction procedures, and at least two periods of tracking practice. Guided practice prior to the full tracking practice should consist of part task practice on reading the CDI and the methods for correcting course deviation errors.

4. Conduct the final test. Simplify the descriptions of the final test profile. Recommend that statements like "Your next maneuver will be to accelerate to 105 knots and then decelerate to 90 knots." pause of 5 sec or so -- "Begin acceleration and deceleration maneuver now." Final test profile may include combinations of turns to headings and altitudes not previously tested or practiced. Ideally there should be at least two repetitions of the standard profile and one period to test extensions of the skills and knowledge.

SUMMARY

Testing takes priority over the VOR tracking task. If necessary, drop VOR tracking and expand the final test profile.

MEMO

SUBJECT: In Cockpit Review of PASS Sessions I and II

DATE: 7 Nov 77

TRYOUT SUBJECT: MAJ White of ARI

SESSION I START TIME: 0930 hrs

1. Had to restart twice at beginning, required about 2 minutes.

2. Auto pilot was still flying the simulator during the initial instructions and this was very confusing, controls were moving about.

3. Demo start signal was inadequate, need cues about when the demo has started and what is taking place, better sync between audio and actions.

4. Auto pilot did not release to subject pitch axis on pitch guided practice.

5. Auto pilot does not release pedals soon enough at start of pedal guided practice. Result is tendency to push too hard and throw system seriously out of sync.

6. Demo on pitch control changes resulted in 140 knots airspeed which is far too great. Cannot have demo or guided practice which results in performances out of system tolerance limits, e.g., 120 knots airspeed. This deficiency may be corrected by demonstrating pitch up before pitch down.

7. Reached RPM audio and light warning on pitch-up demo. System is not compensating with torque adjustments.

8. Timing of instruction to clear controls and the auto pilot takeover or freeze are not in sync.; instruction to clear comes as much as five-ten seconds before auto pilot takes control. Thus, subject clears controls and system goes badly out of tolerance before system freezes.

9. Auto pilot demo lagging audio on airspeed demo.

10. Need instructions on effects of compensations in controls by auto pilot; it affects the subjects feel and movements of the controls.

11. Instructions on how to hold cyclic need to be changed for the time when the auto pilot is controlling lateral, bank, movements and also when it is controlling the pitch movements.

12. Descriptions of altimeter needle sizes are confusing. The 10^4 needle is the thin needle with the triangular end, resembles the second hand, the hundreds needle resembles the minute hand and the thousands needle resembles the hour hand on a clock.

13. Request to read altimeter is not in sync with the demo reading because auto pilot lags the audio.

14. A message is needed to indicate positive transfer of control in both directions: simulator to subject and subject to simulator. These can best be given by VOTRAX.

15. The initial time for practice of altitude control should be increased to at least 30 seconds.

16. Instruction uses the term "bank to one side"; it would be better to say "bank to right or left."

17. Audio and turn to right and turn to left demos are not in sync.

18. Audio leads bank practice.

19. Reference to slip indicator should refer to the two "white lines" as the reference to center the ball.

20. More instruction is needed on the reading of the RMI. Some demo and practice would help.

21. In a helicopter refer to "torque" not power. The reference to power is confusing because the meter is marked as torque.

22. The term "parameter" may be confusing; as in "if you get out of control on a parameter." "If the instrument reading gets out of tolerance," would be better.

23. Eight minutes were used for the VOTRAX audio message demo. This should be in the precockpit instruction phase.

24. There was an additional 5-6 minutes of detailed review following the VOTRAX message demo. This means 13-15 minutes without any subject activity. Cut all reviews to the essential operational information and spend more time in practice.

25. Consider extending the length of the STL practice and allowing for a criterion performance termination. That is, if the individual flies 2 minutes without a warning, he should be advanced. Anyone with warnings should have three minutes.

26. Audio reviews and timing of messages for STL practice were out of sync.

27. The limits on the ball are too sensitive. Increase to ± 1 in place of $\pm 1/2$.

28. VOTRAX volume was set too high.

29. The call sign should be a function of the cockpit number, i.e., 331, 332, etc.

30. Positive control transfer is needed at beginning of STL with side task.

31. Use of side task was not adequate. The request was repeated with a successful response or the setting was not changed.

32. Heading limit was not at 7 degrees.

SESSION I ENDED: 1045 hours

TOTAL SESSION I TIME: 75 minutes

SESSION II START TIME: 1057 hrs

1. Use "torque" not power.

2. System did not release collective per audio for guided practice.

3. Initial setting on torquemeter was 22 not 24.

4. Detailed review of attitude indicator pitch required seven minutes and bank review required six minutes. That is thirteen minutes of wasted time. Get it down to the bare essential and devote more time to practice or testing of STL prior to other demos.

5. Refer to two "white", not black, marks on the slip indicator.

6. Resequence of start of session II. Get review of pitch and bank up front with a practice of STL of at least two minutes; prefer two practice sessions if possible.

7. Lost audio at start of left turn demo.

8. Need a clearer signal on when to start turns, etc. This should come from the VOTRAX so that the timing can be varied without impacting audio tape system.

9. Computer demo of right turn did not reach the desired heading of 270°. It only reached 266°.

10. Use the term "get control of" or "stabilize" the simulator instead of "right the aircraft".

11. The commands to begin the turns and climbs during practice were not given. Again, get this information onto the VOTRAX so that we can manipulate it without worrying about the audio tape system.

12. Heading information wasn't accurate.

13. Demo of climb was out of sync with the audio and it included a climbing turn instead of being straight ahead; right from 270° to 090°.

14. Lost audio on climb demo.

15. Received "heading unacceptable" several times but the system did not reset to the beginning of the task.

16. Received "climb rate unacceptable" but there was no reset.

17. Climb rate warning, "check climb rate", is much too sensitive; expand to ±200 fpm and adjust the other limits accordingly.

18. Too much time was taken in describing the test conditions. Lets get it down to a very quick and simple statement and then get the necessary additional information into the system with the change of segment instructions or place it on a card to be carried into the cockpit.

19. There was a discrepancy between the needle rate of turn, the angle of bank, and the time required to complete the 180° turns.

20. Calls for preset radio channels were not changed often enough. Usually only once at beginning of the session.

SESSION II ENDED: 1205 hours

TOTAL SESSION II TIME: 68 minutes

MEMO

SUBJECT: Review of Precockpit Instructional Materials for PASS

DATE: 11 November 1977

1. The acronymn "SFTS" occurs on page one of Block 1.

2. Figure 7 should have the arrow for the anti-torque pedals directed to the left pedal so that it does not appear to point to the cyclic.

3. Bank is also a correct response to item E in Block two test.

4. The horizon arrow in Figure 10 should point more to the right so that it does not indicate the wing of the miniature aircraft.

5. The wording of the stem for item A in Block three test is not clear. My initial response was to try and relate the choices to the pictures in item B. Try something like, "As an instrument the attitude indicator displays:".

6. The picture choices in item B, Block three should be numbered.

7. Item E in block four test should have at least one choice reading with a five knot increment. The answer to choice one of this item is incorrect; it should read 80, not 85 knots. Also, any discriminations finer than 5 or 10 knot increments is too difficult to assess unless it is a multiple choice format. Call choice three answer about 101 such as 102 or 100 knots.

8. There is a typographical error on page 2, paragraph 2, line 3 of Block five. The word intervals has been typed interfals.

9. The reference to pitch attitude in turns in Block 6 page 4, paragraph 1 line 1 is inaccurate. I'm certain that there are helicopter maneuvers in which pitch varies from level attitude. Use the word "most" rather than "all." If I understand your point, you are trying to say that turns in the helicopter do not require changes in pitch attitude to maintain trim as they do in fixed wing aircraft or that helicopters can climb or climb and turn without using a pitch up attitude and conversely for decending.

10. Pictures are required for the CDI and there needs to be items which focus on how to read and respond to the CDI.

11. Where are the materials describing the activities for Sessions II through IV? I instructed that there be a writeup describing each days maneuvers and their performance criteria, especially for the test segments.

TELECON / ~~CONFERENCE REPORT~~ MDC E1839
(CROSS OUT NON-APPLICABLE TITLE)

SUBJECT/PURPOSE ☒ CONTRACTUAL ☐ NEW BUSINESS ☐ _____ SPECIFY

MODIFICATIONS TO PASS AND PASS DEVELOPMENT SCHEDULE

REF: PERI-OA MEMO, MODIFICATIONS TO PASS AND PASS DEVELOPMENT SCHEDULE, DATED 11 NOV 77

DATE OF TELECON /TR/ CONF. 16 Nov 77

TR NO.

CHARGE NO.

PLACE OF CONFERENCE/LOCATION/FACILITY

TELECON - St. Louis/Ft. Rucker

MDC PERSONNEL

J. Curtin
R. Bull
R. Marco
R. Vidmar

OTHER PERSONNEL/CONTACTS

Dr. Brian Shipley, Jr. - ARI

DISCUSSION/COMMENTS (INFO.OBTAINED, CONCLUSIONS)

1. Purpose of telecon was to discuss the misunderstandings documented in the referenced memo and to achieve agreement on the optimum method to satisfy the request for PASS modification within existing contract scope.

2. Background

a. The Phase I completion report was submitted to ARI on 1 Jun 77 per agreement.

b. No official reply or comment was received from ARI Phase I report.

c. Monthly status reports covering aspects of program progress including potential problem areas have been furnished to ARI.

d. A continuing MDC/ARI coordination interface has been maintained with frequent contract monitor/MDC meetings. Extensive concomitant forwarding of all MDC developed data and materials for C/M review have been accomplished.

e. MDC has maintained an on-site representative software engineer for extended periods since Jun 77.

ACTION REQUIRED/CUSTOMER REACTION

MDC will implement sessions 1 - 5 after ARI approval.

MAC 18.4 REV 12 APR 73)

PREPARED BY R. Bull R. Bull DATE 17 Nov 77

TELECON
(Continued)

f. Intensive on-site software implementation on Device No. 4 began o/a 23 Sept 77 with general MDC understanding that most ARI requested changes had been input at that point. Exceptions understood were maneuver profile development, data collection and the continuing contract monitor/MDC interface.

3. At the initial kickoff meeting and subsequent meetings, there was continuing discussion regarding performance testing, primarily within the context of increasing testing from the first session through the final session in a progressive fashion (15% in Session 1 to 85% in Session 5). This has been accomplished throughout the development of the system, and with the agreement made with the ARI contract monitor per referenced telecon, MDAC will satisfy the required initial test requirement by recovering the preceding session's test segment via an additional console operator intervention task. This will be performed for Sessions 3 and 4 only. Sessions 2 and 5 will have lead-in testing integrated into the session. It was also indicated by Dr. Shipley that the suggestions for the desired sequence of events contained within the subject correspondence should be assessed in light of schedule and manpower requirements to effect those changes.

4. After discussion of cost-effective options available, telecon agreements with Dr. Shipley on 16 Nov 77 are summarized below:

Session One - Minor revision/modify terms, lengthen straight and level (S&L) time period.

Session Two - Total resequencing.

a. S&L for three minutes.

b. Brief review of pitch, etc.

c. Turn instructions and demo.

d. Practice turns (R&L)

TELECON
(Continued)

e. Collective and instrument instruction.

f. Demo and practice.

g. Normal climb, instruct, demo and practice.

h. Testing - two periods - 8 minutes each. Second with side task.

NC . Rough air S&L only.

Session Three

a. Begin by dialing in second 8 minute test period (student or console operator). from Day 2. May use review option if desired.

b. Student or operator initiates Day 3 testing segment (with or without review).

c. Descent instruction, demo, practice.

d. Deceleration - Acceleration instruction, demo, practice.

e. Testing - two periods - 12 minutes each.

Session Four

a. Begin by dialing in second 12 minute session (student or console operator) from Day 3. Review option same as above.

b. Initiate Day 4 testing segment.

c. New material instruction, demo, practice.

d. Testing - as currently designed.

Session Five - Front-end testing as written with revisions using existing practice period retaining three testing periods. S/W Record and Track Formats - for Dr. Shipley's review.

5. It is felt you will find this a cost-effective approach with proper allocation of our remaining manhours. We would appreciate your review ASAP with a telecon of substantive comments so we can proceed.

DATA COLLECTION FORMAT

NOTE: 1) direct to disc - no computation
2) Sampling Rate 2/sec max - less if varaiable change permits.
3) May have to do this by segment???
52 computer words/plus flags

Flag/Field DESCRIPTION		CODE FLAG/DATA
100 CLASSIFICATION HEADER		Use available descriptor names and/or create descriptors
101 DATE	YR-MD-DY	
102 SUBJECT NO.	000000	
103 SESSION NO.	01-99	
104 PROFILE NO.	0000	
105 SEGMENT NO.	00	
106 STARTING CLOCK	HR-MN (MIL)	
107 ELAPSED TIME	Min-Sec	
108 RESET TIME	Min-Sec	
109 RESET COUNTER	000	
110 DEFAULT (TIME) COUNTER	000	
111 ROUGH AIR LEVEL	00	
112 VHF FREQ	000.00	
INPUTS		
200 CONTROL ~~FLGHTS~~		
201 STICK X	± 0000	
202 STICK Y	± 0000	
203 PEDALS	± 0000	
204 COLLECTIVE	% Total	

FLAG/FIELD DESCRIPTION		CODE FLAG/DATA
300 AIRCRAFT POSITION		Use available and/or create
301 TRACK X	± 0000	
302 TRACK Y	± 0000	
303 ALTITUDE	0000	
400 INSTRUMENT READINGS		
401 AIRSPEED (KIAS)	000	
402 HEADING (o)	000	
403 COURSE DEVIATION (o)	000	(VOR ONLY)
404 COURSE DIRECTION (o)	000	(= ")
405 NEEDLE (TSI) (o)	000	descriptor names descriptors
406 VERTICAL SPEED	± 00000	
500 CONTROL INDICATION		
PITCH (o)	± 0000	
BANK (ROLL) (o)	± 0000	
YAW (o)	± 000	
TORQUE %	000	

```
600 SIDE TASK
601 SELECTION                00
602 RESPOND                  00
603
```

APPENDIX M

CONTRACTOR REQUEST FOR A 45 DAY NO-COST EXTENSION

MCDONNELL DOUGLAS ASTRONAUTICS COMPANY - EAST
MDC E1839
Saint Louis, Missouri 63166

15 December 1977
E1B-01-E016-3777

Subject: Contract DAHC19-77-C-0015, Development of an Automated Pilot Aptitude Measurement System for Rotary Wing Aviators, "Contractor Request for a 45-Day, No-Cost Extension"

To: Department of the Army
U. S. Army Research Institute for the Behavioral and Social Sciences
Attention: Mrs. Ollie M. Dickens, Room 6E10
5001 Eisenhower Avenue
Alexandria, Virginia 22333

Reference: (a) Contract DAHC19-77-C-0015, Section H, Paragraph 1, Period of Performance

(b) U. S. Army Research Institute Field Unit Letter No. PERI-OA, "Modifications to PASS and PASS Development Schedule", dated 11 November 1977

(c) MDAC-St. Louis Letter No. E422-77-048, "Submittal of Contract Status Report No. 9," dated 22 November 1977

1. McDonnell Douglas Astronautics Company - St. Louis (MDAC-St. Louis), formerly MDAC-EAST, requests a 45-day, no-cost extension to the Reference (a) contract. This no-cost extension will require the following changes to the contract:

- o Page 4, Section E, Item 0002AD, Phase III Completion Report, Paragraph (1), change 14 January 1978 to 1 March 1978
- o Page 5, Section H, Period of Performance, change 14 January 1978 to 1 March 1978

2. This no-cost extension is necessary for the following reasons:

- o Reference (b) requested the inclusion of the review test feature at the beginning of Sessions II through IV. This requires extensive modifications to syllabus materials, Reference (c), renarration of audio tapes with pulsing, and a system check-out of new tapes.
- o Prior to acceptance test of the Rotary Wing Proficiency-Based Aviator Selection System (PASS) device, development plans include an evaluation of 4 cockpit system performance and data collection techniques using "naive" students as a test group. Suitable numbers of the required test subjects will not be available until the week beginning 23 January 1978.

15 December 1977
E1B-01-E016-3777

- o The data collection and performance measurement requirements have only recently been solidly defined by the Army Research Institute (ARI). As a result, this method will be evaluated during the "naive" student performance assessment to optimize software timing and total system performance.

- o The Christmas and New Years holidays impact system development scheduling at both Ft. Rucker and St. Louis.

3. If you have any questions, please call me at (314) 232-7915.

MCDONNELL DOUGLAS CORPORATION

Frank D. Colaw

Frank D. Colaw
Staff Analyst - Contracts
McDonnell Douglas Astronautics Company - St. Louis

FDC:gw

APPENDIX N

PASS MODIFICATION SUMMARY

An Addendum to this PASS Final Report will be forwarded under separate cover in accordance with the enclosed ARI memo, covering activities completed by the contract 2 April - 13 March 1978.

PERI-OA 6 March 1978

MEMORANDUM FOR RECORD

TO: Charles A. Gainer

SUBJECT: Summary of Meeting tq Assign Priorities to Tasks in PASS Modification SOW

1. Purpose. A meeting was held this date to review and assign priorities to the four tasks named in the PASS Modification SOW. As given at inclosure 1, the results of the meeting will be used to insure that the contractor work effort accomplish the tasks in order of priority.

2. Participants. Mr. Gainer, Dr. Shipley, and SP5 Stackhouse of ARI and Mr. Vidmar of MDC.

3. Summary. Inclosure 1 is a list of tasks in order of priority assigned with supporting comments as appropriate. Other points are enumerated below.

a. When each task is completed it will be submitted to a brief tryout and date of acceptance will be noted.

b. Mr. Vidmar is to alert ARI of any substantial problem in acoomplishing the current tasks. This alerting action should be accomplished no later than one working day following detection of the problem. Early notification will allow ARI and MDC to mutually assess seriousness, alternative approaches, and potential impact on any remaining tasks.

c. Any problem assessment will be accomplished in a joint meeting and the results will be noted on the schedule.

d. Stackhouse is to dupe two copies of the PASS-I card deck at MISO. One copy will be used as the base for PASS-II modifications, the other will be retained as ARI's master.

e. A new disk copy of the PASS-I prototype will be prepared and used as the working base for preparation and tryout of PASS-II modifications.

PERI-OA 6 March 1978
SUBJECT: Summary of Meeting to Assign Priorities to Tasks in PASS Modification SOW

f. Vidmar will maintain a "Patch Record" document as the minimum documentation. Any additional effort remaining may be used to deliver complete listings and more extensive documentation in support of report preparation.

BRIAN D. SHIPLEY, JR., Ph.D.
Research Psychologist

PASS MODIFICATION SCHEDULE WITH TASK PRIORITIES AND COMMENTS

PRIORITY	SOW NO.	TASK NAME	COMMENTS
1	1	Semi-Auto Data Collection	1. Modification will be restricted to PASS Load Module and will be set up to operate in semi-auto mode only when specifically requested. 2. Estimated effort - 1 week.
2	4	Radio Side Task Messages	1. Call signs for each cockpit will be: #1 Army 11 check in on channel #2 Army 12 check in on channel #3 Army 13 check in on channel #4 Army 14 check in on channel 2. A study of delivery algorithm will determine frequency, segment, and range of messages delivered to other than designated cockpit. 3. Estimated effort - 2 weeks.
3	3	Emergency Procedures	1. Shipley, Vidmar, and Stackhouse will investigate emergency procedures possibilities to determine candidates. Vidmar will study candidates and recommend those simplest to implement. 2. Estimated effort - to be determined in selection of emergency procedure to implement and time remaining.
4	2	Unusual Attitude Reset Algorithm	1. Vidmar will investigate problem and, as time allows, will recommend and implement a solution algorithm. Any results short of implementation will be described in the report as support for any ARI in-house efforts to further implement a solution. 2. Effort estimated - remaining time less any time required to prepare a minimum report over the entire effort.